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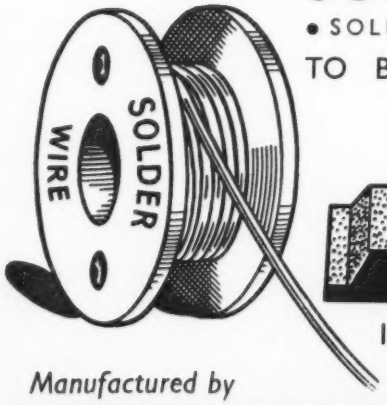

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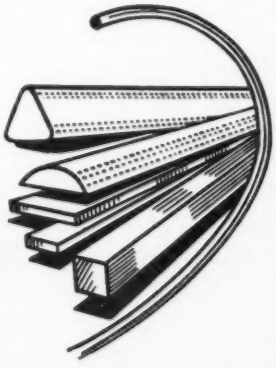

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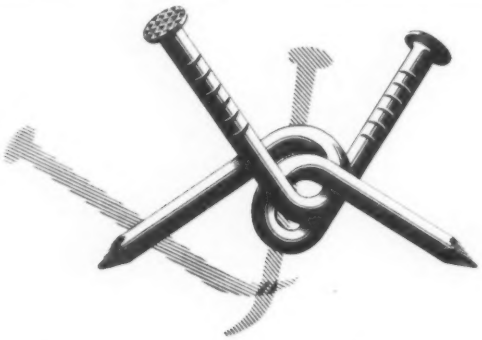

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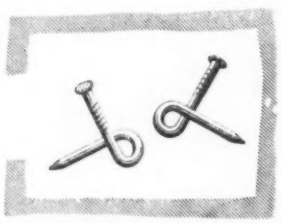

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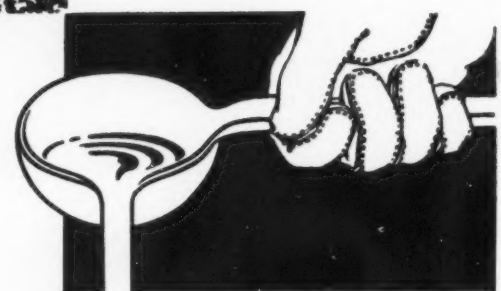

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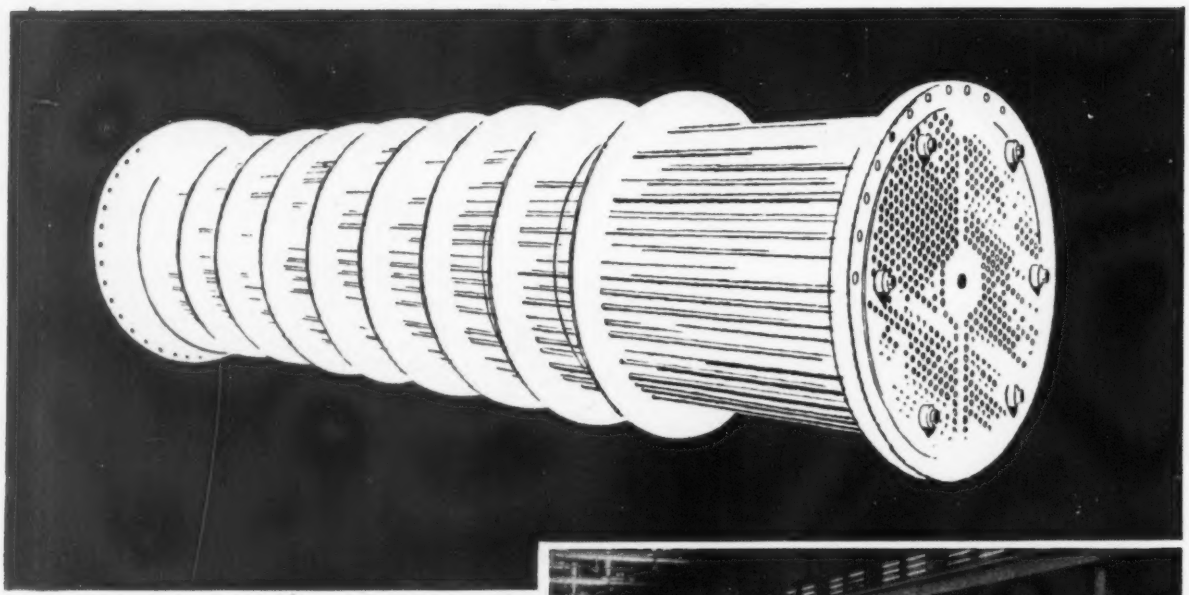

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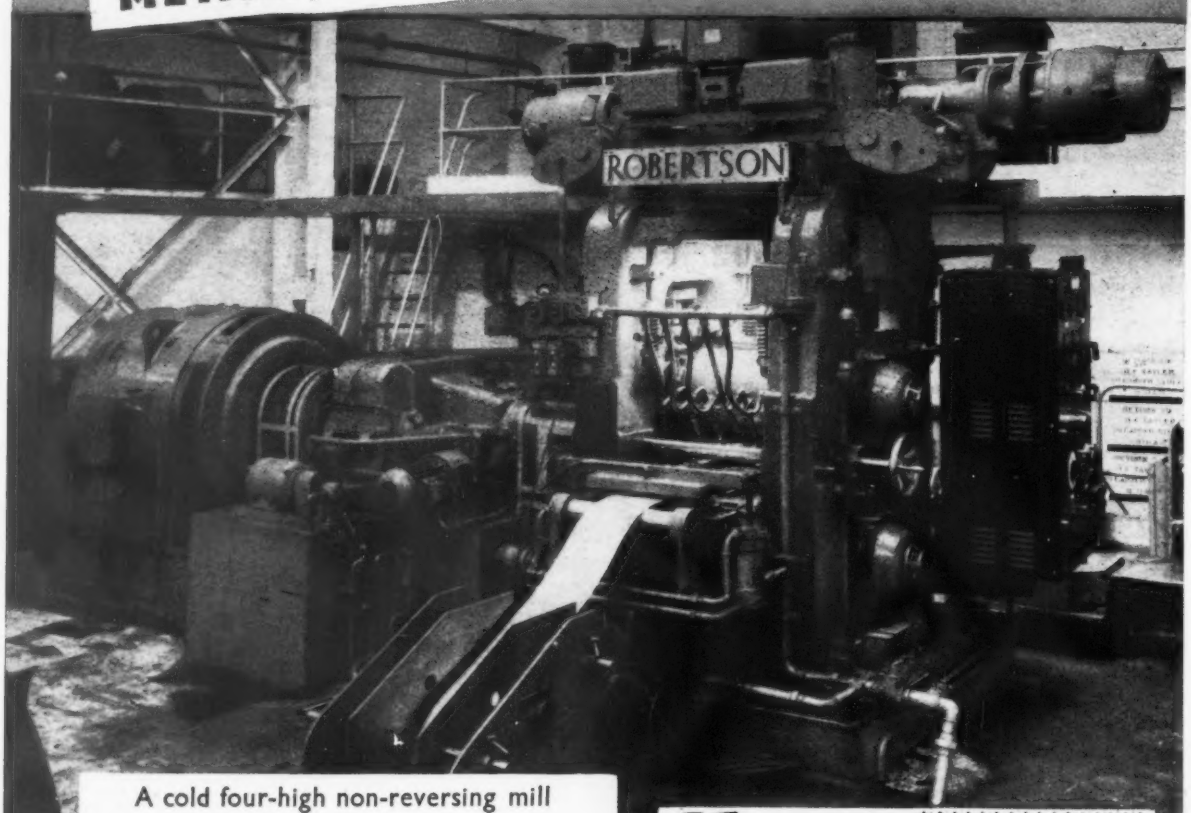

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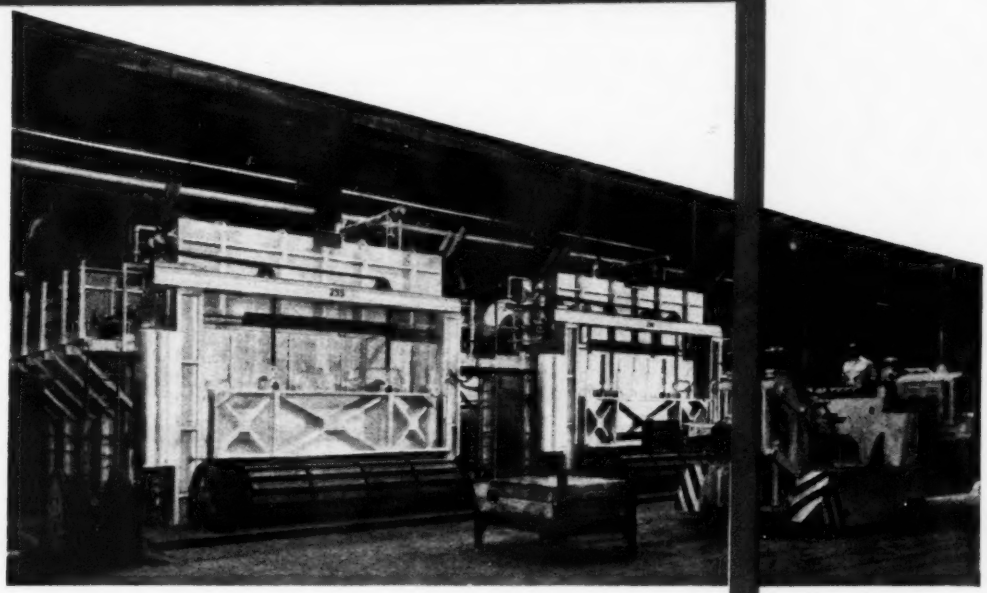

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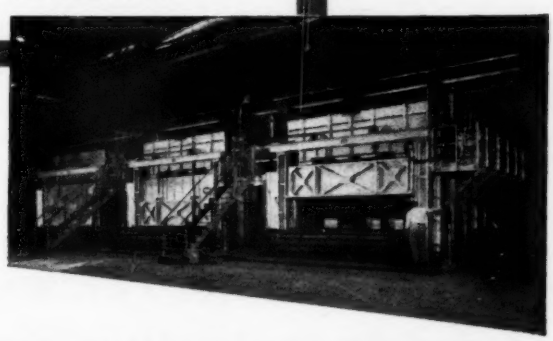

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METAL INDUSTRY

FOUNDED 1909

EDITOR: L. G. BERESFORD, B.Sc., F.I.M.

8 MAY 1959 VOLUME 94 NUMBER 19

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METAL INDUSTRY

VOLUME 94 NUMBER 19 8 MAY 1959

International Research

SINCE the dawn of history, lead and zinc have contributed to the welfare of mankind, and in consequence there is a tendency to accept them and to consider them as old materials. Despite this, the fact remains that both are truly modern metals participating in every phase of current industrial development. Throughout their history, the lead and zinc industries have carried out research to improve their processes and products, but only recently have they combined together to initiate an expanded research programme. Truly international in character, covering the whole of the English-speaking world, the work will be conducted in the laboratories of independent investigators and of member companies, in governmental establishments, and in universities in the United States, Canada, Great Britain, Holland, and Australia. Specifically, the research programme is devoted to the improvement of existing products, the development of new products, applications and markets, and to the acquisition of fundamental knowledge. Since the main object is the expansion of markets for lead and zinc, any inventions arising from the researches will be made freely available to industry in general, subject to reasonable royalties in appropriate cases.

As an example of the strictly metallurgical work already under way may be cited the development of an extrusion press capable of continuously extruding arsenical and antimonial lead cable sheathing alloys. Results to date indicate that arsenical lead alloy can be continuously extruded at a rate of 12-13 ft/min. for 2 in. O.D. sheathing. Again, since it is believed that the poor creep and tensile properties of lead mitigate against its use in many applications, and that improvement of these properties in homogeneous alloys will produce new markets, a comprehensive study of lead alloys is being undertaken to uncover alloy systems showing potential for improvement in these characteristics. Another research aims at developing lead-metal fibre composites which give better strength and creep resistance than homogeneous lead products yet still exhibit the virtues of lead with respect to chemical attack and nuclear shielding capacity, so that these properties can be more universally applied in the chemical and atomic energy industries. Work is now in progress on techniques for producing composites of lead and tin bronze felts. Good impregnation has been accomplished by immersion of the bronze felts in charcoal-covered lead-1 per cent tin baths subject to mechanical vibration. Methods of eliminating or healing the porosity which develops in the composites on solidification are currently being investigated.

Research to improve the corrosion resistance of chromium plated zinc die-castings has already resulted in the development of two systems, either of which, combined with conventional practice, produces a far superior product. In the first, the "duplex nickel process," bright nickel deposited over dull nickel affords superior corrosion resistance at areas of local defects in the chromium plating. In the other, termed "bright crack-free chromium," improved corrosion resistance is obtained by a defect-free chromium deposit. Exposure tests have shown that outstanding performance can be obtained from a system having 0·004 in. copper, 0·008 in. bright nickel and 0·008 in. bright crack-free chromium. Higher mechanical properties, wear resistance, creep strength, low temperature ductility and corrosion resistance for zinc die-casting alloys are being sought by a study of alloys which can be hot chamber die-cast and which may contain aluminium in the range of 5 to 18 per cent. In the field of galvanizing, research is being conducted on the development of zinc alloys possessing improved corrosion resistance to hot water, and on the inhibition of the wet storage staining of galvanized sheet. Cathodic protection of marine tankers, the improvement of zinc lithographers' plates, and of zinc battery cans are other subjects for research.

Out of the MELTING POT

Familiar Method

THAT the fabrication of unusual materials need not invariably mean the use of unusual methods, is shown by a recently published account of some exploratory Russian work on the production of tubes, crucibles, and the like from commercial purity silicon. The work was undertaken with a view to taking advantage of the excellent corrosion resistance of silicon to various acid media at high temperatures. Commercially available silicon of 99 and 98 per cent minimum purity was used. It should undoubtedly prove instructive to pause at this point, consider the various properties of silicon (high melting point, hardness, brittleness, etc.) and then try and think of some method of fabricating it into tubes, crucibles, etc. Having given the matter some thought, one will certainly be in a better position to appreciate the fact that the method chosen and successfully developed by the Russian investigators was casting. Have you ever heard of casting pure silicon? In the absence of any previous practical experience, the investigation was carried out over a wide front to include a range of crucible materials, melting furnaces, melting practices, and mould materials and moulding methods. High-frequency induction melting proved the most convenient. Graphite and graphite-clay crucibles could be used, and were, in fact, necessary because of the very high electrical resistance of silicon at temperatures below 1,000°C., heating of the silicon in the high-frequency furnace depending, therefore, on radiation from the graphite crucible. Crucibles of fused quartz and alumina crucibles were very satisfactory, but had to be placed inside a graphite crucible to make high-frequency heating possible. Oxidation of the silicon during melting in air can be prevented by an argon atmosphere. Protection against oxidation can also be obtained by using a flux based on calcium fluoride. It is advisable to deoxidize the molten silicon with 0·5 per cent by weight of aluminium before casting. For casting, the temperature of the silicon should be raised to 1,550°-1,600°C. Of the various moulds and mould materials investigated, only refractory investment moulds made by the lost "wax" process and, in particular, permanent moulds made of high density (1·7) graphite proved really satisfactory. The moulds had to be preheated to 800°-1,000°C. (in nitrogen in the case of graphite) before pouring the silicon. Furnace-cooling of the filled moulds was necessary to avoid cracking. Cores were hollow and thin-walled to reduce shrinkage stresses. They were made of graphite and were removed from the castings by oxidation in a stream of oxygen at 800°-900°C. Where machining of the silicon castings was required, ultrasonic machining with boron carbide abrasive proved satisfactory.

Clearly Unwanted

PRACTICALLY the whole of the problem of retrieving published information would disappear if those who set out to provide such information and those who ask for it were both to contribute their share towards this most desirable end. The contributions required are, unfortunately, of a kind that are much less readily forthcoming than yet another method of sorting punched cards, or yet another elaboration of some classification system. The trouble is that the really effective contributions would mean that quite a number of useful means for covering up ignorance, and many other similar all-too-human props and standbys would have to be exposed for what they really are and then put aside. It would mean, for example, the acceptance of the fact that no problem can be solved by letting it grow while working on the problem of finding ways and means of solving it. It would mean the realization that in its present form the problem of retrieving information is insoluble and that work on the present lines is only making confusion worse confounded, though, of course, this does not mean that a good time is not being had by all in the process. On the part of those who ask for such retrieved information, this would mean the realization that in future they would have to manage without such information, which would mean giving up hope that somebody had already done the job for them which they themselves should have done long ago, or the hope that, in the absence of original ideas for new lines of progress, the information retrieved will at least show up gaps that could be filled in as a poor alternative. It would mean that both suppliers and users would have to decide to concentrate on current information, the former with a view to its most effective selection and presentation, and the latter with a view to its immediate use in all possible contexts. Both would have to realize that filing information for future reference means confining it to a scrap heap from which it becomes less and less worth retrieving.

Into History

THOSE who have had occasion in recent years to keep a watching brief on, in particular, U.S. patent specifications relating to matters metallurgical can hardly have failed to have become familiar with the name of Joseph B. Brennan, of Cleveland, Ohio, in connection with numerous patents granted to him in respect of methods of continuous casting. A feature of these methods has been the elaborate mechanical equipment introduced with a view to the production of cast rod, strip, etc. More recently, his trend of thought appeared to be moving away from continuous casting to processes that might, perhaps, be described as continuous pick-up. These processes involve the continuous movement of suitable cores, dies, moulds or like cavities through a crucible or other reservoir of molten metal in which they pick up the metal, and from which they carry it to a solidification zone. In some cases the set-up envisaged the passage of the moulds through a vacuum chamber, the process thus becoming equivalent to vacuum casting. The latest patent relating to these continuous pick-up processes claims the use of a grooved core, which is passed through an appropriately shaped crucible containing the molten metal, in which crucible, therefore, the grooves become filled with molten metal. The grooved core leaves the crucible through a suitably designed outlet, which co-operates with the core to enclose the grooves, the molten metal in which is, at the same time, allowed to solidify to form the required shape defined by the cross-section of the grooves and by the co-operating outlet. Beyond the outlet, the solidified picked-up metal products are withdrawn from the grooves in the core. It is with deep regret that one learns from the particulars accompanying this patent of the death of the inventor. There remains the hope that this will be taken as an occasion for an, alas, very much belated, comprehensive survey and appraisal of Mr. Brennan's inventive efforts.

Skimmer

METHODS USED FOR SUCCESSFUL FUSION AND RESISTANCE WELDING

Welding Titanium

SPOT, flash, pressure and fusion welding are all suitable for titanium, and so much progress has now been made in the development of techniques, the improvement of equipment, and the properties of titanium alloys, that these processes, considered difficult only a short time ago, are now entering into everyday industrial practice.

All commercially-pure grades of titanium are ductile-weldable, having excellent flow characteristics and strength, ductility and corrosion resistance equal to the parent metal.

Titanium-manganese binary alloys are not recommended to be welded, nor are ternary alloys of titanium with aluminium and manganese or molybdenum.

Generally speaking, alpha-beta type alloys are not ductile-weldable. Because of its shallow-hardening characteristics and the less potent beta-stabilizing character of vanadium, ternary alloys with about 6 per cent aluminium and 4 per cent vanadium have superior weldability to other commercial alpha-beta alloys, but bends require a radius of at least 12T. These alloys give maximum weld ductility in the medium-strength grades of alloys.

Ternary alloys with about 16 per cent vanadium and 1 per cent aluminium are best fusion welded, solution treated and aged, in which state they give strength and ductility equal to the parent metal.

Excellent welding characteristics are obtained, preferably by arc, spot, seam or resistance butt welding, in ternary alloys with about 5 per cent aluminium and 2·5 per cent silicon. The welds have good ductility and mechanical properties comparable with the base metal.

Of the quaternary alloys so far developed, one with 4 per cent aluminium, 3 per cent molybdenum and 1 per cent vanadium has shown a limited weldability, but the increase of vanadium, decrease of aluminium and replacement of molybdenum with more chromium has been successful in producing a good, weldable metal.

The American alloy, B-120VCA, in the solution-treated and annealed condition, is ductile weldable. It contains 13 per cent vanadium, 11 per cent chromium, and aluminium. If optimum methods of shielding from air contamination are used, the weld metal shows about the same ductility and strength as B-120VCA.

The weld metal, however, tends to age at a somewhat different rate from the base metal, a problem on the solution of which work is now proceeding.

Fusion Welding

The fusion welding of commercially-pure titanium gives joints with excellent properties. Some titanium alloys, however, are less suitable for welding because of the constitutional effects resulting from the thermal cycle.

Sound welds of good appearance, with the same tensile strengths as the parent metal and good ductility in bending, can be produced in commercially-pure titanium. Welds will withstand considerable manipulation before failure and the correction of distortion in welded assemblies can be effected without fear. Alloys with properties not greatly affected by heating or cooling over a wide temperature—such as titanium-aluminium-tin alloys—are available which combine good welding characteristics with fairly high tensile strengths.

As titanium is embrittled when exposed to oxygen, nitrogen, and hydrogen at high temperatures, these gases should not be allowed to come into contact with the heated metal during welding. Thus, the oxy-acetylene, metal arc and atomic hydrogen processes are not suitable for titanium, but inert gas arc processes effectively avoid exposure of the hot metal to the atmosphere.

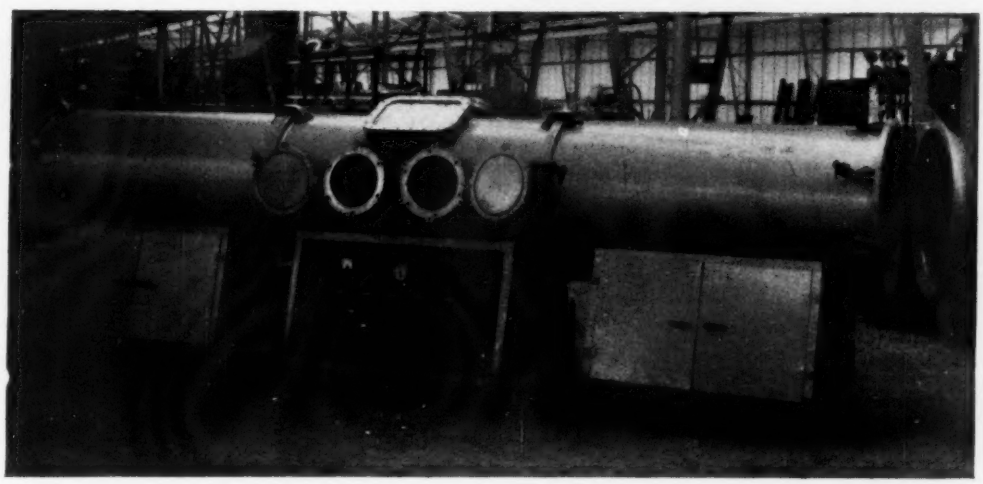
Additional precautions have to be taken to protect all hot surfaces not shielded by the argon issuing from the welding head, and to minimize contamination and consequent hardening of the weld and adjacent zones which can occur as the result of entrainment of air in the argon shroud.

These requirements can be met by welding in argon-filled chambers arranged so that the torch and filler rod can be manipulated without any ingress of air, but the difficulties of achieving a sufficiently pure atmosphere within the chambers, and the limitations imposed on accessibility and manipulation, render the method cumbersome and unattractive for most types of work. However, considerable work has been done in this direction and, for welding in the open air, techniques are now available by which atmospheric contamination can be almost entirely prevented.

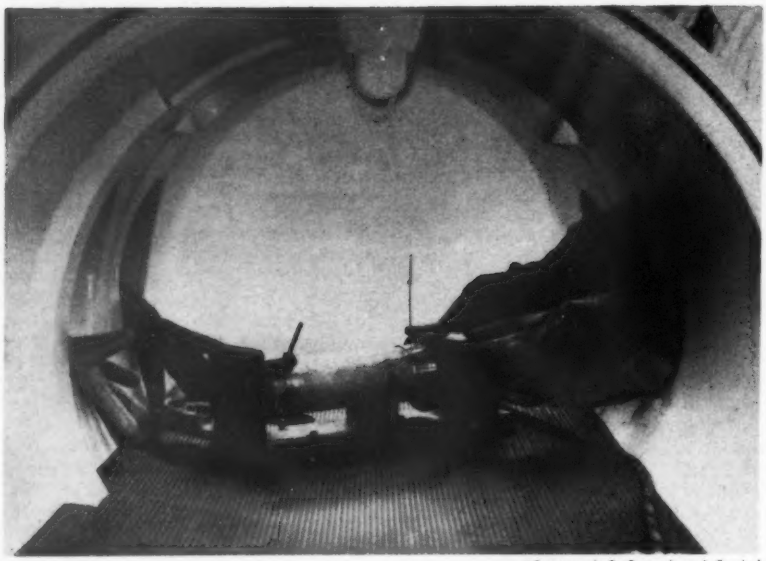
Most welding has so far been effected by the tungsten arc process, which will probably remain the most extensively used method.

For this process, best conditions are obtained with straight polarity D.C. supply and thoriated tungsten electrodes—which avoid spatial instability of the arc. Conventional D.C. welding generators and argon arc torches are satisfactory, but the power source should be provided with a switch at the welding station, enabling the operator to extinguish the arc when required without removing the torch from the weld and so allowing the hot metal to cool within the argon atmosphere.

[*Courtesy J. R. Bramah and Co. Ltd.*



A specially-designed welding chamber showing the glove port covers in the open position, all the controls being enclosed in the cabinet beneath. A special vacuum pump is wheeled between the various chambers and coupled to the union joint on the top right hand corner of the panel. Where uneven floors are encountered jacking fixtures are arranged—as shown—on the centre portions so that the extensions can be removed and replaced without difficulty



[Courtesy J. R. Bramah and Co. Ltd.

Interior of the chamber shown in the previous illustration. The second operator's rubber gloves can also be seen

With titanium it is even more important than with other non-ferrous metals to remove any grease or oxide scale completely before welding. During welding, care has to be exercised in manipulating the torch to prevent excessive turbulence in the argon shroud, which could lead to the ingress of air and severe contamination of the weld metal. The torch must be moved evenly along the seam without weaving, so that the weld is afforded maximum protection.

The welding speed has to be regulated so that the weld metal leaves the argon atmosphere at a temperature low enough to avoid contamination. Where filler rods are used, care must be taken not to remove these from the protection of the gas cover. Additions of metal to the pool are made with the minimum movement of the rod so as to avoid turbulence in the argon.

By selecting a torch nozzle with an orifice of appropriate size for the type of seam or joint being made, and by avoiding excessive gas flows, turbulence is reduced to a minimum.

As argon is heavier than air, welding should be carried out in the downhand position, and with the components horizontal or slightly inclined to the horizontal.

Automatic unfilled butt welding can be effected without preparation on sheet up to $\frac{1}{8}$ in. thick. The amperage varies for these thicknesses from 15 to 210, the argon flow from 8 to 55 ft³/hr., and the welding speed from $2\frac{1}{2}$ to 27 in/min.

In all cases, automatic welding offers important advantages as it is possible to achieve almost perfect protection from the atmosphere. Elongated nozzles, baffles, chills and secondary shrouds are adopted to suit the particular work involved, and excellent protection of the rear surfaces is achieved by mechanical means or by an auxiliary supply of argon.

Manual welding can be carried out satisfactorily with material of a wide range of thicknesses and, using baffles and chills, argon flows to the torch need not exceed 24 ft³/hr. No edge preparation is required for material up to $\frac{3}{32}$ in. in thickness, and a single run is sufficient. For thicker sections, vee-edge preparation and multi-run techniques should be used.

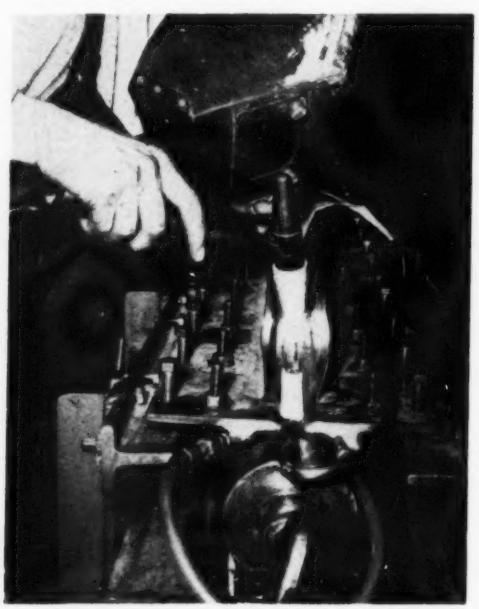
The currents used for the unfilled butt welding of sheet between 27 S.W.G. (0·016 in.) and 10 S.W.G. (0·128 in.), using chills and speeds of about 6 in/min., range from 18 to 150 amp. When filler rods are used, the currents are slightly higher.

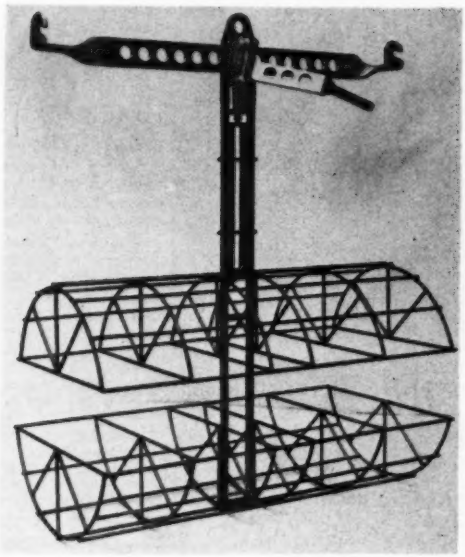
The weldability of the new quaternary alloys is still being exploited. That of the titanium-aluminium-molybdenum-vanadium alloys is very limited. The solution-treated and annealed vanadium - chromium - aluminium alloy B-120VCA is, however, ductile weldable. If optimum methods of shielding from air contamination are used, the weld metal shows about the same ductility and strength as the base metal, which is a useful attribute. The weld metal, nevertheless, tends to age at a somewhat different rate than the

[Courtesy J. R. Bramah and Co. Ltd.

Left: Insertion of a titanium lining into a mild steel vessel ultimately intended to contain hot caustic liquor

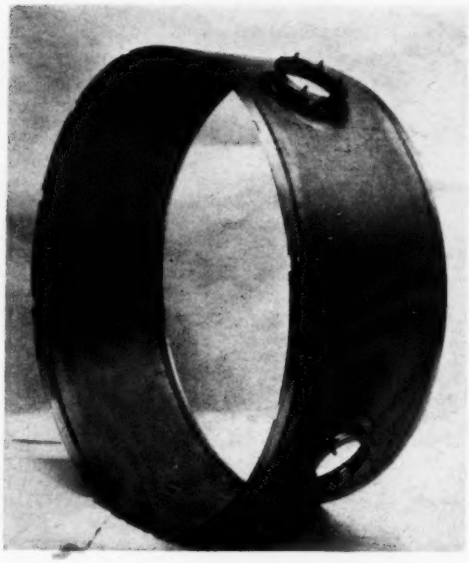
Right: Welding a 16 S.W.G. titanium tube using water-cooled clamping bars and a perforated argon supply tube for the underside of the weld. The argon deflector plates are visible either side of the torch





Courtesy J. R. Bramah and Co. Ltd.

Left: All-welded titanium anodizing jig



Right: Titanium aircraft engine manifold with the halves fusion welded and the machined rings resistance welded prior to final machining

base metal, thus the technique is being further developed in order to achieve optimum strength/ductility combinations simultaneously in aged, high-strength weld and base metal.

Corner and edge welding of sheet up to 10 S.W.G. is effected by fusing the edges together without the addition of filler metal, but baffles and chills should be used. Argon backing is the easiest to apply, and devices constructed on the same principle as those adopted for butt welding should be used. They are constructed to fit closely to the components while leaving a space behind the weld line into which the argon is introduced. No support need be given to the underbead, as it has little tendency to collapse.

The currents required for corner welding are, with sheet from 10 to 16 S.W.G., from 45 to 110 amp. at speeds of from 4 to 6 in/min., with an argon flow of 24 ft^3/hr. Slightly higher currents are used for edge welding.

More elaborate techniques are needed for fillet welding, due to the greater number of surfaces needing protection. A combination of some of the backing devices used in butt and corner welding provides adequate shielding. Additional baffles are not usually required, as the components themselves serve this purpose. Filler rods are always used.

Reinforced lap welds can be made in sheet of a wide range of thicknesses, but the rear of the lower member must have argon protection and the components must be held tightly together to prevent contamination occurring through the root of the joints.

In many arc welding jobs it is not easy to use the backing plates and shields described because of inaccessibility, but the rear of the seams can be protected quite simply. With hollow components made by butt welding, for example, the whole of the internal space can be flooded with argon, and by having a slight positive pressure it is possible to control the extent of penetration. In the construction of assemblies involving corner welds, the necessary protection can be provided by a perforated tube laid behind the weld line and supplied with argon. The gas is conserved in the weld zone by means of copper foil attached to the components with adhesive plastics tape on either side of the weld line—at a distance from it where the temperature does not become sufficiently high during welding to destroy the bond.

This method can also be adopted for butt welds and for protecting the rear surfaces of fillet welds.

For upper surfaces, baffles and chills can easily be adapted; they can be produced at low cost and tailored to fit the components involved.

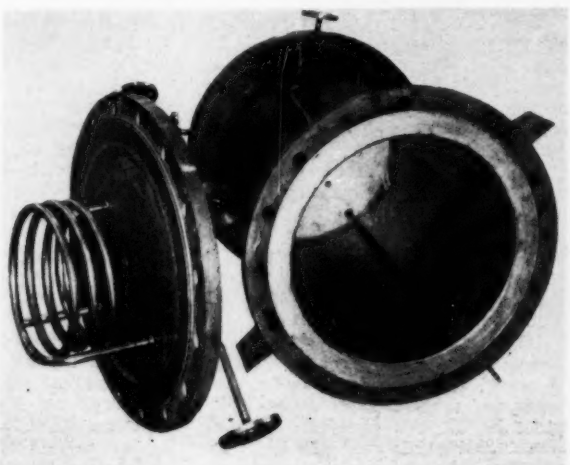
Operators already skilled in the argon arc welding of other materials soon master the titanium techniques. The main points specific to the welding of titanium are that the ability to produce satisfactory welds in titanium requires not only manual dexterity but also demands a higher degree of mental alertness than is required when dealing with other materials.

Skill in avoiding contamination need not be great if thought is given to devising arrangements which will minimize turbulence, or the effects of turbulence in the argon shroud, and which will increase the cooling rate of the weld metal and the extent of argon coverage on the upper surfaces.

Resistance Welding

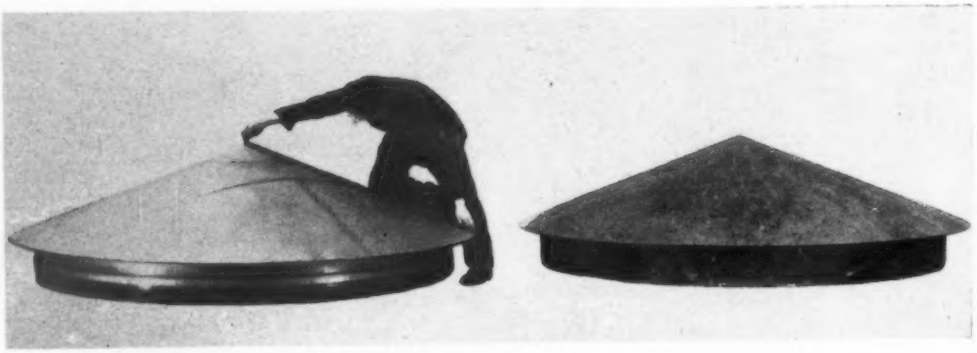
The electrical resistance of titanium is similar to that of stainless steel, thus it is well suited to spot and seam welding. Up to 16 S.W.G. in thickness, good joints are obtained with ordinary equipment over a wide range of machine settings, the main requirement being the initial care in surface preparation.

Titanium is supplied in the descaled and pickled condition, and can usually be welded satisfactorily without further treatment other than to ensure freedom from grease.



[Courtesy I.C.I. (Metals Division)

Titanium lined steel vessel fabricated by Marston Excelsior Ltd., using I.C.I. titanium



[Courtesy J. R. Bramah and Co. Ltd.

Mild steel cone 7 ft. 10 in. in diameter clad with titanium to resist the corrosive attack of sea water mixed with exhaust fumes, producing sulphuric acid. These are to be inserted in the funnels of certain passenger liners

Although chemical treatments give the lowest contact resistances, mechanical cleaning methods give values almost as low and result in joints with equally good properties. It is always better, however, to abrade the surfaces lightly to ensure uniform contact resistance.

After surface preparation, titanium can be stored for long periods without deterioration in its welding characteristics.

No shielding gas is normally used in resistance welding because of the short duration of the welding cycle. Some contamination of the weld plugs does, however, occur, and the magnitude of the resulting hardening increases in inverse proportion to the thickness of the sheet. With 16 S.W.G. the weld plugs are 35 V.P.N. harder than the unwelded sheet, and with 28 S.W.G., 70 V.P.N. harder.

Although domed electrodes are common in the United States for spot welding, truncated cone electrodes are the commonest type in this country. Domed electrodes should have a face contour of 3 in. spherical radius, and flattened electrodes large cone angles to prevent excessive electrode indentation.

The diameter of the flats in the flattened electrodes depends on the thickness of the sheet, electrodes with faces of $\frac{3}{16}$ in. to $\frac{1}{4}$ in. diameter being used for 16 S.W.G. sheet, and $\frac{1}{8}$ in. to $\frac{3}{16}$ in. for thinner materials.

The electrode pressure depends on the type of electrode used. Loads for flat-ended electrodes can be quite small, 50 lb. being found adequate for a wide range of sheet thicknesses, but electrode pressures up to 300 lb. are more common.

Pressures with domed electrodes are much higher, being usually between 600 lb. and 2,000 lb. The current impulse should be less than 20 cycles in duration, and the current should be adjusted to give a weld penetration of more than 75 per cent of the total thickness of the components.

The shear strength of spot welds in low-grade commercially pure titanium is good, joints being made with shear strengths ranging from over 600 lb/spot in 28 S.W.G. sheet to over 3,000 lb/spot in 16 S.W.G. The testing of such joints always shows the desirable plug type of failure with deformation of the nugget.

In the harder grades, welds also have good shear strength, but fail with a brittle fracture.

With high-strength ternary alloys, welds having satisfactory shear strengths can be obtained, but the welds and heat-affected zones are generally brittle and modification of welding conditions secures no improvement. However, single-phase alloys and those containing aluminium and having only a small amount of second phase present are much more suitable for resistance welding.

Pressure Welding

Due to the high temperatures involved, satisfactory fusion welds in titanium can only be made when precautions are taken to avoid hardening in the weld zone. Pressure welding is, however, possible at temperatures within the forging range where oxidation and the rate of diffusion of the hardening elements into the interior are relatively slow.

In pressure welding, the interfacial areas, which must still be clean at the temperature of jointing, must be brought into intimate contact so that the interatomic forces can come into play across the boundary. Joint strength is primarily determined by the extent of deformation occurring at the interface—time, pressure and temperature all affect this.

Pressure welding is the best means of joining bar and tubular stock. Joints in low grade commercially pure titanium are as strong and ductile as the parent metal. Welding is best effected at about 800°C., and the heating can be carried out with an oxy-acetylene ring burner without any contamination of the stock provided that the times involved are not excessive.

The interfacial areas must be clean and held tightly together to minimize oxidation during the heating cycle.

As the thermal conductivity of titanium is low and the rate of increase of plasticity with temperature high, the deformation under load can be restricted to a very narrow zone. Deformation at the interface, expressed by increase of area in relation to final area, must exceed 30 per cent to give consistently strong welds. The pressures involved are not great, those not exceeding 4·5 tons/in^2 being suitable for butt jointing $\frac{1}{2}$ in. diameter bar.

At high temperatures, titanium dissolves its own oxide, thus any oxidation of the mating surfaces which occurs during the heating cycle will not result in inclusions in the weld zone—as is common with other materials. In fact, without careful study of the crystal structure it is impossible to define the original interface.

Pressure welding can be applied to some of the titanium alloys, but to develop optimum joint properties it is necessary to heat-treat after welding.

Flash Welding

Flash welding of titanium requires machines which facilitate rapid burn-off and upset, to prevent excessive contamination. Sheet and sections up to 2 in^2 in cross-sectional area can be welded at present and development is proceeding with larger sections.

The process can be effected in open air, but inert gas protection improves the weld ductility. Flash welding gives a more uniform structure than inert gas arc welding because of the forging action and resultant grain refinement.

Flash welds in commercially pure titanium have good ductility, but the high-strength alloys give welds of low ductility and there is some risk of cracking. Heat-treatment is useful in restoring the ductility in such alloys. Those alloys which give ductile fusion welds can be flash welded without much loss of ductility.

Vacuum Technology

FOLLOWING the preparation in 1954, 1955 and 1956 of draft glossaries of terms used in vacuum technology, the Committee on Standards of the American Vacuum Society Inc. has now issued a booklet containing the finalized glossary to date. Co-operation with the British Standards Institution has ensured as much agreement as possible between the recommended standard nomenclature and the British Standard glossary.

The booklet, price 10s., is published in this country by Pergamon Press Ltd., 4-5 Fitzroy Square, London, W.1.

Continuous Rod and Strip Casting

(*Concluded from* METAL INDUSTRY, 1 *May*, 1959)

AT the Wednesday afternoon session of the Institute of Metals Spring Meeting, the discussion on continuous rod and strip casting by the Properzi, Hazelett and rotary machines was continued. This part of our report contains the contributions to the discussion which arose during the afternoon.

DISCUSSION

C. Smith (James Booth and Co. Ltd.) said when casting by the ordinary chill casting process, solidification proceeded from two faces and met in the middle, with the result that in the centre there was marked shrinkage which was never amply compensated for by liquid metal, and there was a considerable amount of porosity down the centre. In the hottest part of the casting there was a considerable amount of exudation of eutectic in a zone below the feed-head as well as considerable porosity. In order to overcome that difficulty, in due course the D.C. process was invented, which brought into being the principle of directional solidification in which the metal was solidified from the bottom upwards, so that in effect there were not two waves of solidification meeting in the same ingot and there was no central porosity. But there was still a certain amount of exudation on the outside, and occasionally if the process was not under control there was a zone of porosity near the periphery of the billet. Considerable difficulty was encountered in overcoming those problems.

It was surprising to hear that the length of the cooling area in the machines was 40 in., whereas over a long period the cooling area had been gradually shortened in order to overcome various problems which had arisen.

Mention had been made of the presence of a certain amount of inverse segregation on the castings, and one would have thought that that was evidence that chilling was not being carried out efficiently. What had the authors to say of the Hunter engineering process which involved the principle of short solidification areas and which appeared to work fairly satisfactorily?

In regard to the inverse segregation, it would be of interest to hear whether efforts had been made to overcome it, and whether the authors had thought of tapering the mould area. In between the two processes—the normal chill cast process and the D.C. process—there was an intermediate process where a thin walled mould was used which was filled with liquid metal, and lowered into water at a controlled speed so that there was a similar sort of solidification. In that case it was necessary to use a tapered mould, and in a mould of that kind, as the billet solidified so it slipped down in the mould and there was seldom any inverse segregation at all. Had the designers of the Properzi process given any thought to the use of controlled tapering? Having in mind the cost involved in heavy hot and cold rolling plants would the newer processes become economically competitive?

H. Chadwick (Northern Aluminium Co. Ltd.) asked what was involved in the difference between 61 per cent and 62 per cent in the conductivity. That represented one part in 62.

The Paper referred to composition and tempering as affecting conductivity. Were there any other factors which had not been mentioned and which had an effect? For instance, could the rate of cooling affect the orientation of the grains and thereby affect conductivity? How important was the tempering of the rod to the customer? One specification gave a maximum limit of 9 tons/in^2 for the ultimate and 15 per cent elongation. It would be possible to get variation of strength down from 9 tons to 5 tons and elongation from 15 per cent to 30 per cent.

Some information would be welcome on how long it took for the defect-indicating device to trigger off the spray, and how long the spray operated after the defect had passed. In other words, if there were a single defect in the rod, what length of rod would be sprayed and how far away from the defect would the spray be?

Authors' Replies

J. B. Russell said that Dr. Bramley had pointed out that it was easier to control contamination by hydrogen and oxides in the conventional casting technique, say, D.C. casting, than in the Properzi process. For himself, he failed to see that there was any distinct difference in the ability to control contamination by hydrogen or oxides in those two processes. It was possible to check the metal in the furnace for hydrogen content before casting if there was any question about its quality.

Dr. Bramley referred to the possible effects of segregation by adding boron in the form of a master alloy. That was true. If boron were added as a hardener and it settled to the bottom of the furnace, complexes would result which would show up in the casting. It should not be allowed to settle on the bottom. There was no harm using boron-containing fluxes. They were messy to work with, but they were cheaper than having a boron hardener.

As to the most flexible type of fuel for use on the melting and holding furnaces, the authors favoured gas if it was economically available. Electricity was all right in the holding furnace, but it had one limitation in that it was difficult to flux in the holding furnace if the medium were heated by means of Nichrome elements. Obviously the lining in the furnace used for handling D.C. conductor metal must be relatively inert. Very little silicon and iron could be tolerated. Ninety per cent alumina brick was very good, but recently bricks containing 85 per cent alumina had been found satisfactory.

The positioning of the belt in the groove was questioned. It was important from the standpoint that the metal as it left the spout flowed in the proper direction and should not be deflected towards the belt. There should be plenty of latitude for adjusting the position of the spout. The authors had no definite figure on the percentage of scrap generated due to casting defects. Electrical conductor metal was not produced at their own plant and therefore no figure was available.

Mr. Greer mentioned that there might be some 20 ft. of the first casting produced which was scrapped, and possibly 10 to 15 ft. at the tail end of the run. The percentage was indeed very low.

Dr. Bramley mentioned the distortion of the belt and the eutectic exudation which sometimes occurred on the belt side of the casting. He also mentioned that it might be possible to use additional clamp-down rolls. In principle that suggestion was probably entirely correct. The advantage to be gained by placing an additional clamp-down roll was that it would counteract the movement of the belt if it tended to expand. He also commented that there appeared to be a variety of operating conditions. That was very true. In some respects certain things were in a state of flux, but it was due to the fact that Properzi operators were progressive, and were always trying to make changes with a view to improvement. All those efforts sooner or later became known among Properzi operators, and everyone gained by it. There were only a few operators who were in trouble, and perhaps would always be in trouble because they had failed to recognize a few of the basic principles which governed the structure and conductivity of aluminium.

Dr. Bramley showed some macro-structures of Properzi casting and wire drawn therefrom. It was pointed out in the Paper that the grain size of the Properzi casting appeared to be on the coarse side in the absence of grain refiners. The one shown by Dr. Bramley was abnormally coarse, and that particular casting was probably run under what might be called "hot conditions". The structure of the wire appeared to be odd for wire which was supposed to be 0·1 in. in diameter having been drawn from 0·375 in. He suggested that Dr. Bramley might check it because it looked as though it might have been considerably larger than 0·1 in. in diameter. It was admitted however that the structure was unusually coarse.

The authors were not familiar with the Canadian specification limits in respect of minimum tensile and conductivity requirements referred to by Dr. Bramley. It was understood that the tensile requirements were higher than the present standards for 61 per cent minimum wire.

It was agreed that more work should be done on the physical and mechanical metallurgy of a Properzi-made casting and the wire and rod drawn therefrom. Unfortunately, most of the Properzi operators were not equipped to do that type of work, and it was hoped during the coming year, in co-operation with the large companies producing EC metal, to undertake some investigations.

It was known that Mr. Greer was favourably impressed with the results that he was obtaining with the type 6B mould as against the type 6 mould. As to the possibility of using cheaper refractories in the furnaces, admittedly 90 per cent alumina brick was the epitome of refractories, but it was expensive. The 85 per

cent brick was suitable for EC metal. The fluxing or salt penetrating technique was being used, although actual reports on the effect of the treatment had not been received by the authors. He agreed with Mr. Greer that fluxing with chlorine in a holding furnace heated by means of electrical resistance was a very difficult situation.

The business of spouts varied all over the world. In fact, it seemed to vary from operator to operator.

R. D. Hamer, in reply to Mr. Green, said that ½ in. material had been cast with the rotary and Hazelett processes, and it was believed that with the latter process it would be feasible to cast thinner materials.

Mr. Pendrey asked a number of questions about conductivity. A copper mould had been used and in fact the net result was no different from that when a steel mould was used.

As to the continuous reading of the exuding temperature, that was quite feasible if it had to be done. Efforts had been made to make the process extremely simple and the more gadgets were incorporated, the less attractive it was to people who had no technical staff. It was found that for common alloys the temperature ranges it was possible to work in were such that no problem arose. One was really interested in casting material which came out at hot rolling temperature, and with a reasonable period of trial and error that could be achieved and maintained.

It was necessary to have a good weld, and the technique for that had been worked out with such success that, by and large, he was satisfied that the normal operator could achieve the necessary practice.

On the question of cheaper sheet for roofing purposes, that was the aim, especially with the Hazelett process. Provided a market could be found in a particular area where 20,000 tons of roof sheeting could be used, a Hazelett machine could be put in which would operate at a cost which would make it inexpensive.

Mr. Smith had referred to the question of porosity, but the signs of porosity were few and far between. The structure in high purity aluminium was equiaxial, and that could be fixed up by grain refining. The same applied in the case of the rotary casting process.

Segregation was something which had appeared and which had been got rid of. It was a question of control of the cooling.

Mr. Hunter doubtless had an excellent process, but it would seem that in comparison with the processes under discussion it would be more expensive. In addition the speed of operation was low. With the rotary casting process producing a ¾ in. × 12 in. bar it was possible to produce 2 tons/hr. With the Hazelett it was possible to go up to 5 or 6 tons/hr. which was getting beyond Mr. Hunter's machine's productive capacity.

With regard to controlled tapering, in the Hazelett process the tapering of the gap, if it could be arranged, would create a beneficial effect. Cooling was done in both processes fairly rapidly, and efforts were made to eliminate excessive cooling so that the bar came out at hot rolling temperature.

It was expected that both processes would be very competitive with conventional processes of all kinds. In the case of the Hazelett process where a market had not yet been developed which was big enough to warrant the making of Hazelett sheet, the saving achieved was all in the first part of the process.

Men and Metals

At the annual general meeting of the Aluminium Development Association, held in London last week, **Mr. Rudolf Hahn** was elected President for the ensuing year. Mr. Hahn represents, on the Council of the A.D.A., the

Association of Light Alloy Refiners and Smelters Limited. He is chairman and managing director of B.K.L. Alloys Limited. At the same meeting, **Mr. S. E. Clotworthy,** the retiring President, was elected vice-president of the association. Mr. Clotworthy is managing director of Northern Aluminium Company Limited.

In view of the completion of the first phase in the development of the research laboratories at Heston of Atomic Power Constructions Limited, the following appointments have been made by the company:—**Mr. H. E. Dixon,** M.Sc., F.I.M., to be head of research and development; **Mr. A. G. H. Coombs,** B.Sc., A.I.Mech.E., to be deputy head of laboratories, and **Mr. D. C. F. Lunn,** F.I.M., formerly deputy chief metallurgist, to be appointed chief metallurgist.

It has been announced by Kayser, Ellison and Company Limited that the following have been appointed as local directors of the company: **Mr. L. W. Hicks,** A.I.M., **Mr. E. D. J. Holloway,** and **Mr. H. D. Button.**

We learn from **Mr. N. T. Burgess** that he has left the Aluminium Development Association to join the Research and Development Department of the Central Electricity Generating Board in London, where his function as welding metallurgist will be to study the problems concerned with weldability of materials used in steam power plant, and with non-destructive testing. Mr. Burgess joined the metallurgical staff of the A.D.A. some four years ago, after serving in the research laboratories of the British Aluminium Company Limited.

News from United Wire Works (Birmingham) Limited is that **Mr. J. C. Haselgrove** has been elected a director of the company and also appointed sales organizer.

Chairman and managing director of Baird and Tatlock (London) Limited and of Hopkin and Williams Limited, **Mr. J. E. C. Bailey,** C.B.E., is visiting Canada and the U.S.A. While in America, Mr. Bailey will address the Scientific Apparatus Makers of America at their annual conference at White Sulphur Springs, West Virginia. He will speak on the European Common Market, and how it will affect exports from non-member nations, including the United States.

At the invitation of the Society's Council, **Mr. C. R. Norwood** has accepted a Fellowship of the Royal Society of Arts. This distinction is a recognition of his contribution to the art of die-casting. Mr. Norwood is technical director of Sagar Richards Limited, and through his efforts the casting of aluminium bronze has been brought to a high pitch of perfection by his company.

It is announced by Tube Investments Limited that **Mr. W. Hackett, Jnr.,** and **Mr. R. D. Young,** B.Sc., have been appointed assistant managing directors of the company.

Chairman of the local board of Armstrong Whitworth (Metal Industries) Ltd., and a member of the Joint Iron Council, **Mr. J. Bell** is visiting Canada this month to meet industrialists and steel manufacturers. The purpose of Mr. Bell's tour is to familiarize Canadian manufacturers with European metallurgical research and development, and methods of maintaining quality at every stage of production.

Appointed as special assistant to the President of The International Nickel Company of Canada Limited, **Mr. Thomas Archibald Stone** was previously Canadian Ambassador to the Netherlands from 1952 until the end of last year. In his new association with International Nickel, Mr. Stone will also serve as special assistant to the President of the company's United States subsidiary, the International Nickel Company, Inc., and will have his headquarters at that company's office in New York City.

It has been announced by the Lead Development Association that **Mr. S. A. Hiscock,** M.Sc., A.I.M., joined the staff on May 1 last. Mr. Hiscock was recently with Enfield Cables Limited, and in his new position will be principally engaged in duties associated with developments in the use of lead in the cable industry.

TWIN-HEAD HORIZONTAL MACHINE FOR EXTRUSION BILLETS

Billet Coring

IN coring billets for tube extrusion, conventional practice has been to drill the bore on vertical machines, or to pierce on high capacity presses. Both processes involve drawbacks, especially the former, where eccentricity is often encountered. Recent developments in billet casting techniques and equipment have, moreover, enabled extruders to eliminate the machining of the billet to remove scale and surface imperfections, and thus the difficulties of coring have been accentuated.

With these problems in mind, A.M.T. (B'ham) Limited, 505 Bristol Road, Bournbrook, Birmingham, 29, have introduced a self-centring billet coring machine of novel design that is claimed to give faster and more accurate production. Basically, it comprises two drilling heads, a self-centring vice, and a base on which these are mounted, plus the necessary electrical, electronic and pneumatic equipment. It is capable of taking a billet up to 10 in. in diameter, and normally a billet 18 in. long can be accommodated, although longer billets could be drilled if necessary.

In operation, a billet is placed on the lower jaw of the vice and the closing button pressed, setting the jaws in motion until they grip the billet. As locking pressure builds up, a pressure switch is tripped and this starts the two main motors. The unit heads traverse rapidly into the drilling position, the slow traverse is then initiated, and drilling begins, with coolant flowing to the drill tips. After a predetermined depth is drilled, the heads retract (to clear swarf), re-enter, and drilling continues. At a preset position one drill retracts entirely and the bore is cleared through by the other drill. An interlocking device prevents drills fouling each other. The units then retract, main motors are switched off, and the vice jaws open. A further interlock prevents the jaws opening until the units are stationary. For a typical $7\frac{1}{4}$ in. dia. copper billet the actual drilling time is 47 sec., using a $1\frac{5}{16}$ in. dia. drill at 450 r.p.m. and a feed of 0·020 in/rev.

The vice jaws are vee shaped, the closing mechanism being operated by a 6 in. pneumatic cylinder which, through this mechanism, self-centres and mechanically locks the jaws when gripping the billet so as to prevent the jaws from unlocking if any failure occurs in the air line.

The vice jaws may be changed readily to suit different billet diameters, the jaws being located in tenons parallel with the slideways of the machine frame and unit heads. Packing pieces of varying heights to suit billet diameters are also available.

An end stop is provided for location of the billet, and interchangeable drill bushes are carried in sturdy bearers mounted at either end of the billet position. A complete change of drills, bushes, vice jaws, etc., to accommodate a different size of bore and billet, takes approximately 25 min. Billets of any alloy can be handled if speeds and feeds are selected to suit.

Centring accuracy is such that a turned bar can be located within 0·001 in. of its true centre.

Each of the unit drilling heads is driven from a 20 h.p. Laurence-Scott motor. The drive for both the spindle and the feed screw is taken from this motor, a separate motor providing a rapid traverse into the drilling position. Variations of feed and speeds are obtained from a pick-off gear mounted under a separate cover on each unit.

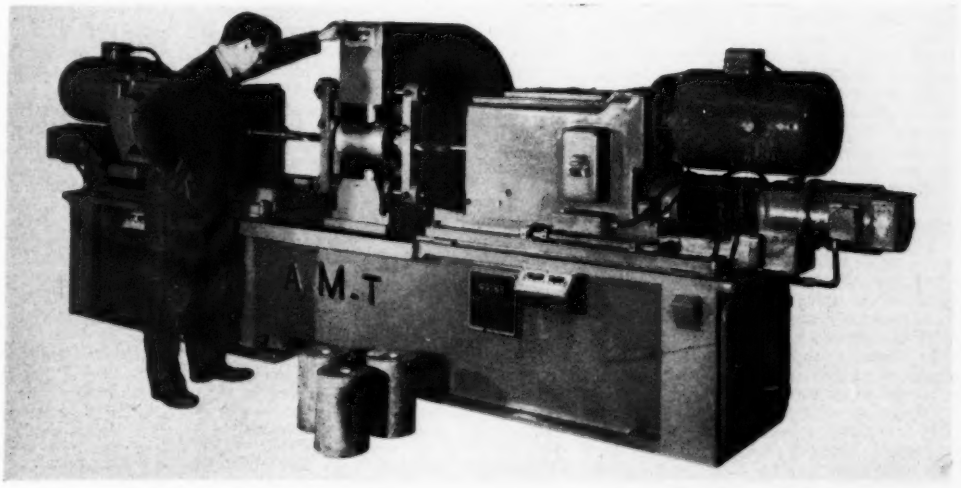
Each of the unit heads has its own gearing, two drive motors (one for main spindle and feed, one for rapid traverse), and a series of trips that enable the sequence of forward and retracting movements, and the rapid traverse to be adjusted as required. The main drive for the spindle and traverse screw is taken from a 20 h.p. Laurence-Scott motor, the rapid traverse from a separate motor.

The main frame of the machine is a stress relieved steel fabrication, housing at each end a cabinet in which electrical and electronic controls are mounted. These include air break contactors for motor control, oil proof push button controls, and an electronic timer for the unit movements for woodpecker feed. A feature of the electronic system is the flexible plastics-covered wiring. Current is 400-440 V 3-phase A.C.

External controls on the machine include a push button for "vice jaws open" and another for "vice jaws close," together with an emergency stop, all of which are mounted on the front of the machine above the vice jaws.

When the emergency stop has been operated, the machine can only be restarted after the cycle has been completed. On each of the units there are forward and reverse inching controls for setting purposes, a button for starting the automatic sequence, and another for hand operation.

Full lubrication at all points is provided, the main gearbox unit running in an oil bath with pressure feed to the bearings. The coolant motor is built into the machine, and filter and water traps are incorporated in the air lines.



The A.M.T. billet coring machine, with a billet in position in the vice

INFORMAL DISCUSSION ORGANIZED BY THE INSTITUTE OF METALS

Protection and Packaging of Non-Ferrous Metals

(*Concluded from* METAL INDUSTRY: 24 *April*, 1959)

PHYSICAL damage to the contents of cases as a result of handling necessitates special precautions being taken, in the provision of adequate wrapping around the goods themselves. This problem, together with those of corrosion and vapour phase inhibitors, formed the topics for the concluding contributions to the discussion on "The Economic Protection and Packaging of Non-Ferrous Metals in Storage and Transit," organized a few weeks ago by the Institute of Metals.

DISCUSSION

Mr. Slingsby (British Aluminium Co. Ltd.):

It seems clear that fine or special finishes require something better in the way of methods than those used for commercial products, at least in respect of safeguards against handling and transport damage. These finishes are used mainly for anodized decorative purposes and also for reflectors after treatment. Some fretting or minor damage may be acceptable in commercial products but is certainly not on special finishes. I would like to emphasize this point and say that good stiff cases are essential as a basic starting point, having regard to the fact that the bulk of this type of work is in small lots requiring transhipment. These finishes are costly to produce and it is illogical to jeopardize the quality by undue economy in packing.

The use of traditional cases is to be recommended. Briefly, for small cut sizes of sheets, strips, coils and circles the top and bottom are of $\frac{3}{4}$ in. timber, and the sides and ends of $\frac{7}{8}$ in. The ends are panelled with 3 in. by $\frac{7}{8}$ in. battens to form what is known as a "Manchester End" which gives a good nailing surface and will withstand very considerable compression loads. Appropriate battens are fitted, of course.

The larger standard size sheets can be accommodated in cases having $1\frac{1}{2}$ in. thick sides and ends and $\frac{3}{4}$ in. top and bottom, again with battens appropriate to the length of the case. In many instances an internal type of lid is used with traditional home order cases, but for special finishes an external lid is preferable for two reasons: first, it gives the case a greater stability than when the internal type is fitted; secondly, the pressure arising from other cases stacked on top is not transferred to the contents to the same extent as it may be with an internal lid.

Cases to accommodate sections and tubes of fine finish should also be of the traditional type having a "Manchester End" where the cross-section of the case is 12 in. square and greater; otherwise two vertical battens on each end are sufficient. The timber thicknesses are similar to the cases previously described with battens appropriate to the length.

There are two main reasons for using the traditional type of case. One is to safeguard the metal during transit and transhipment. This is particularly important where rail transit is involved, because the B.T.C. cannot reasonably be expected to be specialists in the handling of small lots of such finishes as those under discussion. They have to lay themselves out on the basis of average handling methods to suit a large variety of goods. The other is for protection during off-loading and handling during storage at customer's premises. It is surprising the number of concerns accepting goods of this nature possessing few or no facilities for off-loading initially and handling during storage prior to processing.

For the above reasons it is as well to limit the nett weight of cases containing sheet, coils and circles to 5-6 cwt., and 7 cwt. in respect of sections. The very nature of tubes keeps the nett weight sufficiently low.

Adequate protection of the metal surfaces is of great importance. For this purpose a good grade of tissue paper is sufficient for sheets, strips, circles and coils 22 S.W.G. thick and less, not in the fully annealed condition. For gauges thicker than this, except in coil form, something better is required and for this purpose 2-ply cellulose wadding is suitable. It may be unbleached but must be free from undigested pulp and grit, as indeed all interleaving paper should be. All fully annealed metal, irrespective of gauge, should be interleaved with wadding rather than tissue paper, where this is possible. Annealed coil presents a problem, as the interleaving medium cannot be allowed to remain during the anneal and rewinding to introduce it can be a prolific source of damage. Possibly the answer to this is a really tight coil initially. It is of no little importance to see that the whole of the surface of the metal is protected. The paper or wadding can unknowingly be displaced by air pressure during handling into the cases unless care is taken.

Sections having special finishes should be protected by continuous interleaving when the size permits of this, prior to packing, and tied in suitable bundles. A word in connection with the tying medium is not out of place at this point. Some types of string containing rayon have absolutely no stretch or give in them and these can damage thin sections and tubes. Should it be considered that there is any possibility of damage it is advisable to use adhesive tape instead of string.

Large sections that cannot readily be interleaved and tied in bundles should be interleaved with layers of tissue paper as they are packed. In the case of sections having wide thin webs and/or in soft condition, cellulose wadding should be used. Tubes below $\frac{1}{2}$ in. diameter need not be interleaved unless in the soft condition, but should be tied tightly in convenient bundles. Tubes over $\frac{1}{2}$ in. diameter should be interleaved.

The small cut size sheets, circles and coils may be parcelled in kraft paper and the parcel sealed with an adhesive tape but when the units are too large to parcel collectively they must be individually wrapped.

It is probably superfluous to recommend that all nails should be thoroughly clenched after being driven from the inside of the case when the size of the case permits of this, and an examination of the cases in respect of this matter should be made prior to packing.

In order to present a smooth bed for the metal, a sheet of 40 oz. strawboard may be placed internally on the base and the case lined with an envelope of kraft union, the folds being sealed with an adhesive tape of suitable width, say $1\frac{1}{2}$ in. The metal must be stacked in the case hard up against one side and one end and finished to such a height that the level of the metal is just about $\frac{1}{4}$ in. above the level of the sides. This allows for subsequent settlement, and causes a slight pinch on the metal when the lid is fitted thus helping to prevent movement of the contents.

As it is uneconomical to construct tailor-made cases to suit individual sizes of products, some blocking or wedging off is frequently necessary. For small cut sheets, circles, strips and coils, strawboard should be introduced between the wedges and the contents. Wedges should be broad on the face—never narrow—and the ideal condition of wedging is just to spring the side of the case slightly. In the case of soft, very thin, cut sheets it is advisable to use a protective sheet of plywood or thin timber between the wedges and the metal. Where the free space in the case is too wide for conventional wedges, say at the end, the stool method may be used; that is, a false end supported by wedges nailed to the side of the case.

Substantial standard size sheets may be secured in the case by opposed slow tapered wedges between the edges of the sheets and the sides and ends of the case. These wedges should be reasonably long so as to spread their pressure over a good part of the sheet edges.

It is advisable to use the stool method for thin gauge and/or soft sheets and so present a full length timber face to the sheet edges.

Section requires a substantial end block to withstand the inertia of the contents in the event of heavy end impact. Internal battens are generally used between the lid of the case and the contents, but these must be well padded to avoid damage to the contents.

Similar remarks apply to tubes but very generous padding is required for these and/or soft tubes.

With regard to preservation during transport and storage, these fine finish products are not usually stored for appreciable periods and unless long storage is anticipated or specified, it is usually sufficient to line the cases with a kraft union envelope which may be sealed with a self-adhesive tape. As previously mentioned, ordinary kraft paper may be used to wrap the product itself, having regard to its size or shape.

To avoid deterioration in storage of home orders when the conditions are not usually as severe as in exported orders, the case lining should be of kraft polythene laminate and sealed with a waterproof cloth tape having a zinc oxide adhesive (self-sealing). The units of metal may be

wrapped in kraft union where possible and sealed with a similar tape, or narrow coils and circles of suitable size may be contained in kraft union envelopes and sealed.

For exported metal for more or less immediate use the method just described can be used, but for storage under tropical or sub-tropical conditions it is recommended that the case lining should be of aluminium foil, laminated to a cellulose film and coated on both sides with a heat sealable coating. Joints in the lining can be rapidly made with a hot iron. As an additional safeguard, interleaving may be carried out with chromate impregnated paper, instead of cellulose wadding with some slight risk to the surface quality.

One form of preservation is to apply oil, preferably lanolin, or petroleum sulphonate in a base of non-volatile mineral oil, but the product would have to be degreased before processing and few concerns take kindly to this. Another method is to use a prefabricated tin plate lining and finally seal up with solder; although this is a very efficient method, it is costly.

I would like to turn now to the ordering and storage of the packing papers and would say that they should always be ordered to a specification when one is in existence: for example, kraft union, CS.1993; waterproof tape, CS.2191 or CS.2501E; foil laminate, CS.2132C.

Storage in a dry heated area is desirable, particularly in respect of the interleaving media, as cellulose wadding has an avid appetite for moisture. Ideal conditions are those having a relative humidity of 50-60 per cent but these are not readily obtainable.

However, the best available storage conditions should be used and tests carried out for moisture content which should not exceed 10 per cent of the dry weight. Where the humidity is higher than desirable the frequency of testing should be stepped up. I stress the importance of dry packing papers because I have seen the disastrous results that can arise from damp papers.

A further test for water penetration is desirable on the waterproof media and can be carried out in a very simple vessel of which the base is made up of the paper to be tested. The container is filled with water containing a dye so that any penetration will be readily visible on a filter paper underneath and in contact with the medium being tested. A test duration of 24 hours is sufficient.

A chemical test to determine the level of corrosive agents in the packing papers is of great importance. Reasonable limits for these are as follows: chloride as NaCl 0·05 per cent; sulphate as Na_2SO_4 0·25 per cent; copper 0·01 per cent; and a *p*H value of 5·5 to 7·5.

In conclusion I would like to say how important it is to see that all packing operations are carried out in a warm dry atmosphere with as low a relative humidity as it is possible to attain. The room or building in which the packing is carried out must certainly be free from atmospheric grit as this is one of the greatest enemies of special finishes and indeed commercial finishes also. Handling must be kept to a minimum, and wherever possible the metal should be inspected directly into the containers.

It appears to me that efficient and safe packing is a combination of the following: (1) the purchase of reputable packaging materials to specifications when applicable; (2) cases of sound design and efficient wedging; (3) good workmanship and a careful analysis of any and all complaints so that faults and weaknesses may be remedied; (4) the application of common sense to all the principles involved.

J. E. Taylor (Evan Cook's Packers Ltd.):

As export packers, besides packing items relative to D.E.F. and other service manuals, we do set out to pack machines and assembly of various types, anything from 1 cwt. to 20 tons in weight, for export. To that end we do tend to work on a number of basis principles, those being: (a) acclimatization of the commodity prior to packing. (b) adequate cleaning prior to packing; (c) adequate protection of the commodities by temporary rust preventive where possible; (d) completely sealed moisture vapour barrier; (e) a reduction as far as possible of all hydroscopic materials within the barrier, and (f) the correct amount of desiccant as and where required.

As far as the acclimatization of commodities is concerned, endeavours are made, wherever possible, to have any piece of machinery, mechanism or assembly in the packing shop at least 24 hr. prior to assembly in order to acclimatize the piece of equipment to the shop conditions, which are set at a moderate temperature and moderate humidity in order to vaporize any moisture that may have condensed on the machine during previous storage, or in transit to our packing shops.

Prior to the actual packing any rust preventive that has been previously applied is cleaned off, and the job cleaned down thoroughly prior to our own application of temporary rust preventive of the TP2A type. It is not always possible to apply rust preventive all over these machines due to the diversity of materials in the make-up of the assemblies, but wherever possible, and where experience dictates, this is done.

In so far as humidity barriers are concerned, we tend to stick to one material, namely polythene, and wherever possible make all these export packs into polythene barrier packs.

Any extremities, abutments or sharp corners on these assemblies are cushioned with cellulose wadding to prevent any puncture or abrasion of the polythene over-wrap, which is adequately sealed by a well-known portable thro-feed sealer on the market. The barrier is made up of a sheet of polythene on the base of the case. Most of our cases are machine-type cases and machines are positioned on the case base on stools, blockings, or both. The base of the polythene bag is laid on the base of the case, the assembly is placed in position with relative materials in between the two to afford protection against abrasion of the polythene. The outer bag is then slipped over the top of the machine, and sealed to the polythene base by the thro-feed polythene sealer. Any blockings and other packing materials wherever practicable are kept outside the barrier. Before the barrier is completely sealed, the air within the barrier is pumped for about one hour through a piece of equipment built up by ourselves, containing a heater unit and a perforated container unit inside which is silica gel. The air is drawn out from one side of the bag, pumped through the heater unit to absorb as much moisture as possible and pumped back into the bag. After that period one end of the bag is sealed and then air is drawn out with the same unit. When the maximum amount of air has been drawn out, the bag is sealed. In many cases silica gel is used as a desiccant inside the barrier as and when required, but adequate protection is given, in many cases by the temporary rust preventive. If the desiccant is used it is put in just prior to the bag being put over the machine and sealed.

D. Tonkinson (Wm. Palfrey Ltd.):

One of the drawbacks in connection with the use of ordinary kraft paper for the packaging of metals, non-ferrous and ferrous, has been the fact that, due to the incorporation of chemicals during the reduction of the pulp to paper, traces of the chemicals used in this reduction come on to the surface of the metals in contact and the metal tends to become stained or discoloured or even, in some cases, corroded. Extensive efforts to wash these chemical traces out of the paper did not meet with great success prior to 1939. Kraft paper, therefore, was only used on relatively small scales for direct wrapping of metals, largely as a body paper for laminates or coatings where grease resistance was not required. During and after the second world war, however, as a result of the need for stockpiling both raw materials and finished products for long periods whilst preserving them in perfect condition, a process was perfected to overcome this difficulty. The pulp is treated prior to and during manufacture to produce a paper with a *p*H value of 7. That is neither acid nor alkaline. It is, therefore, incapable of producing any stain, discoloration or corrosion even if in contact with the metallic surface for a long period. Whilst the paper itself may be alkali or acid free that does not stop a corrosive atmosphere from attacking the metal and it would be usual to use a vapour phase inhibitor paper and/or polythene where these conditions were likely to pertain. Full details of this paper can be supplied to anyone interested.

Mr. Taylor mentioned interleaving paper and he brought up the point that sulphate, chloride and acidity were all factors to be taken into account in determining the suitability of different grades. Another speaker has mentioned the importance of considering the alkalinity. In my opinion, however, a detailed study of the physical properties can be no substitute for a field test, particularly if this is carried out under the actual conditions of service required.

L. G. Sliney (The Telegraph Construction and Maintenance Co. Ltd.):

Mr. Barker has covered most of the ground in regard to available materials used as moisture barriers, but perhaps there is one omission—polythene laminates. These may comprise polythene applied to low substance papers—perhaps a little heavier than tissue—kraft papers: board; aluminium foil, or combinations of these materials. Some of these may be reinforced with hessian or other textiles. The impression has been given, that in the majority of instances, bitumen bonded kraft or waxed papers are adequate, particularly when one considers their lower cost. However, in the polythene laminate range, one is able to produce laminates having burst strengths which vary from a few lb/in² to the order of 100 lb. and with moisture vapour permeability rates of 20 gm. to 1 gm. per 24 hr. These figures are in relation to the conditions of test employed by P.A.T.R.A. and the Ministry of Supply.

In conclusion, by far the largest element of cost is that of the raw materials. In recent years, there have been several

reductions in the price of polythene which have been instrumental in bringing about an increased usage of these laminates.

C. H. Bridgen (British Road Services): Mr. Rydings of the Railway Clearing House gave the views of the carrier from the railway aspect and to a great extent, of course, our problems are similar.

The most difficult problem seems to be the question of condensation. Mechanical damage is a relatively straightforward problem; to be perfectly candid, it usually involves putting right our own shortcomings, i.e. handling in our own depots. Everything possible is done to give guidance to our staff in the care which they should exercise in the handling of all types of metal products to avoid abrasion and damage of all kinds.

On the question of condensation, we have come up against the same problem with regard to the sheeting of our vehicles. Experiments with different types of sheeting materials have been carried out in order to give protection against wet damage—that is to say, exterior wet damage—but at the same time this problem of condensation has to be taken into account. Basically we have found, from the point of view of vehicle sheets, that the most satisfactory type of material so far has been the ordinary type of flax material with either a silicone or a dry chemical treatment. In other words, the sheet must still be allowed to breathe. With plastics sheetings—completely impervious materials— we get this condensation to a far greater extent than with normal flax sheet with dry proofing or silicone treatment, with which we are still experimenting.

With regard to the more simple mechanical damage, it would help us considerably if when packing small consignments—that is to say, the smaller 10 cwt.—1 ton lots, which inevitably involve transhipment because it is just not economical from our point of view or yours always to carry these through to their destination in the same vehicle—the packing was of a higher standard than for the full vehicle loads. That is common sense; it is nothing new. But people sometimes expect that the small lot can be given the same standard of packing as the full vehicle load and it just will not work out. There must be transhipment and if the packing is not up to a high standard it will run into trouble. Our facilities for handling commodities vary from depot to depot and although we do equip our depots which specialize in certain types of commodities with the right equipment to deal with those commodities, when it goes to an out-of-the-way place, through a depot which is not geared up to handle it, you are liable to get mechanical damage.

F. A. Champion (British Aluminium Co. Ltd.): Sodium benzoate was suggested as an inhibitor in which people have not taken sufficient interest. As far as aluminium is concerned, it is out owing to alkalinity.

L. J. Soper (Northern Aluminium Co. Ltd.): It appears that no one has had a great deal of experience with non-returnable packs. Are there any people here who specialize in making packing cases and who can give advice on the subject?

S. F. Fisher (Northern Aluminium Co. Ltd.): With regard to the cheap and non-returnable pack, what is the minimum economic pack which High-Duty Alloys consider should be used to maintain this price of 0·3d. per pound?

Would Mr. Soper consider the type of pack which he has been experimenting with to be suitable for use with a mixed load of extrusion bundles and smaller cases or skids?

R. A. Jones (High-Duty Alloys Ltd.): After about a year of experiment with the non-returnable pack we have been using it for two years successfully, mainly with lorry transport. It has not been successful with rail transport simply because the railway do not permit us to secure the packs in the wagon. On a lorry you can always rope your stillages to the base, which makes quite a bit of difference. So far our loads have been in the region of 5-12 tons, which may mean something like 12-25 cases per lorry. These have travelled quite successfully. There have been very few complaints of fretting.

In connection with the packing materials costs, we want something like 1,000 lb. minimum pack to make it somewhere near 0·3d. per pound. We are trying to get lower naturally, but so far have been unable to get below 0·3d. For this type of pack a wooden platform with double-faced corrugated board is used for the outside. The inside of the pack is made up of corrugated cardboard, using for a wrapping paper the kraft union or sisal kraft according to the customer and destination. The sheets are naturally interleaved with paper. When the top double-faced fibre board is put on, the whole lot is banded to the stillage with one band longitudinally for the 72 × 36 in. size, and three bands along the width. This travels quite successfully. So far, we have not gone above 10 ft. in length nor wider than 36 in. with that length, but the width has been increased when the length was reduced. So far 96 × 48 in. is the maximum combination.

H. Baskerville (Imperial Chemical Industries Ltd.): The last speaker has said that they have tackled this largely from the point of view of consignments of 5-12 tons. That seems to me to be the easy end. With road transport that means it is going to be point to point transit with no off-loading at intermediate points. Have the company any experience of dispensable packages for small consignments, 2-3 cwt., which accounts for a very large proportion of the packages used in the non-ferrous metal industry although probably not for a very large proportion of the industry's output?

Mr. Slingsby: Mr. Jones made a significant remark regarding interleaving: he said "of course" the sheets are interleaved. Would those sheets have been interleaved had the pack been in a traditional case, because if not surely some quite considerable extra expense must be involved in interleaving.

R. A. Jones: Interleaving is normal trade practice.

L. J. Soper: In reply to the second part of Mr. Fisher's question about non-returnable packs. As previously mentioned, experiments on a limited scale have been instituted and a complete load could be tried provided it was shipped direct from works to one destination. It would also be necessary for everyone handling these packs to pay particular care and attention as it is rather different handling a cardboard carton as compared with a robust wooden case.

S. F. Fisher: What about mixed loads? Would the smaller packages with extrusion which one inevitably carries on what might be termed round-the-house deliveries, be suitable for combination with that particular type of load, as distinct from the through load?

L. J. Soper: A lot of our material is shipped by our own transport and this enables greater control to be exercised over the people who are handling the goods, and for this reason it would be a fair risk.

G. H. Bridgen: Non-returnable packs, pallets and so forth, have proved reasonably successful in some cases, but it does come back to this very important point of transhipment. This is a vital factor. In our own case, a very small consignment has to go through our parcel services; it has to be transhipped two or three times; it has to go over conveyor belts, put on trucks in certain places and man-handled to vehicles. In other places one is able to deal with it on mechanical handling equipment. It depends on all these factors. If these things are being tried it is essential to consult very carefully with the carrier first to see what the method of routing is going to be and what the handling facilities are at various places. If it is a full vehicle load the problem is considerably reduced.

W. D. Rance (High-Duty Alloys Ltd.): Hardly any of our packs go out as complete loads; they are transhipped once and probably twice. We have not had any trouble at all from handling due to transhipment, stacking or from transport personnel standing on the packs.

Obituary

Mr. T. Allen

IT is with regret we record the death, at the age of 77, of Mr. Thomas Allen, J.P., chairman of Barker and Allen Ltd., Birmingham, for twelve years. Mr. Allen, a member of the Birmingham City Council from 1931 to 1946, had been a magistrate since 1938.

Mr. I. Heathcote

WE regret to record the death of Mr. Ian Heathcote, technical sales representative of Brayshaw Furnaces Ltd., Manchester, who was well known in engineering circles in the North of England.

Sir W. Larke

WE also record with regret the death of Sir William Larke, K.B.E., a prominent figure in industry during two wars and the period between. He was manager of the power and mining department of the British Thomson-Houston Company from 1899 to 1912.

In 1939 he was made chairman of the Advisory Committee on Non-Ferrous Minerals at the Ministry of Supply, and early in 1942 he was appointed controller of Non-Ferrous Mineral Development, a post he held until the conclusion of hostilities. He was then elected vice-president of the Iron and Steel Institute, and in 1947 was awarded its Bessemer Medal.

In the course of his long career he occupied many other important positions, including the presidency of the Institute of Welding and of the British Standards Institution.

Industrial News

Home and Overseas

New Product

An unusual piece of chemical plant, a still constructed entirely from pure platinum, was designed and manufactured recently in the production shops of **Johnson, Matthey and Co. Ltd.** The still, one of three destined for a Far Eastern Government, consisted of a 5 in. diameter spherical distillation unit fabricated from platinum 0·02 in. thick, linked through a platinum tube 11¼ in. long by 0·4 in. bore and 0·015 in. wall thickness to a helical cooling coil with 5 turns, and constructed from platinum tube 0·2 in. bore and 0·012 in. wall thickness.

Though the purpose for which the still is required has not been disclosed, it is certain that it will be used for the distillation of a highly corrosive liquid. Platinum is the most generally corrosion-resistant of all the metals and alloys available to the designer of chemical plant, and is usually employed where extremely corrosive materials are to be handled or where the purity of the end product is of great importance.

Change of Address

Sales and service representative of **Research and Control Instruments Ltd.** for the whole area of Scotland, Mr. E. Wilson has removed to a new address at 35 Hilton Road, Bishopbriggs, near Glasgow, with the telephone number of Bishopbriggs 2320.

A Golf Meeting

Final details are announced of the meeting of the **Non-Ferrous Club Golfing Society,** which is to be held at Stratford-on-Avon Golf Club on Wednesday, June 17 next, commencing at 9.30 a.m. Two rounds will be played—a round against bogey in the morning for the METAL INDUSTRY bowl, followed in the afternoon by a Greensome against bogey.

Lunch will be served at the Golf Club, and dinner has been arranged in the evening at the Welcombe Hotel, Stratford-on-Avon, followed by the presentation of prizes.

A Sheffield Exhibition

A private exhibition is being staged by the **Mond Nickel Company** at the Cutlers Hall, Sheffield, from June 2-5, featuring the properties of nickel, nickel-containing materials, the platinum metals, and S.G. iron. In addition to being the largest and most important nickel producers in the free world, the Inco-Mond Organisation produces many other materials, including almost half of the free world's production of the platinum metals. Therefore, the exhibition has been designed to feature the range of company products and to illustrate the special properties which make them vital materials for many applications in modern industry.

The exhibition is divided into sections dealing with mechanical and physical properties, corrosion resistance, electro-deposition, strength at high temperatures, toughness at sub-zero temperatures, and welding. These main sections are further subdivided, and include demonstrations as well as specimens of materials. Each day a number of technical films will be shown relating to various aspects of the exhibition, including films on S.G. Iron, Nickel Alloy Permanent Magnets, Welding, Corrosion, etc.

Selling to Argentina

Now making its maiden voyage to South America, Houlder Brothers' S.S. *Swan River* is carrying in its holds a considerable proportion of a £500,000 annealing plant for the Sociedad Mixta Siderurgia Argentina. This plant, built by the **Incandescent Heat Company Ltd.,** will anneal 300,000 tons of steel annually. The furnaces are supplied as packaged units completely assembled in Great Britain.

Enquiry from Iran

Tenders are being called for by the Secretariat, Sugar Company of the Plan Organization, Avenue Shah Reza, Tehran, for eight units of hydraulic tube-bending machinery. A copy of the tender documents, including specifications (in French) is available at the Export Services Branch, Board of Trade, Lacon House, Theobalds Road, London, W.C.1. A photo-copy set can be purchased from the branch for 3s. 0d. (Ref. ESB/10218/59).

A Summer School

Advance notice is given by the **Battersea College of Technology** relating to their sixth Summer School on Corrosion, which will be entitled "Newer Materials for Resistance to Corrosion" and will be held in the Metallurgy Department of the College from September 28 to October 2 this year, inclusive.

The lectures, given by authorities in their particular field, will deal with newer materials, metallic and non-metallic, for resistance to aqueous and high-temperature corrosion. The topics will include:—design in corrosion, nickel alloys, stainless steels, titanium, zirconium, tantalum, precious metals, plastics and coatings of plastics, fibre-glass, paints, etc.

Fee for the course, including lunch and refreshments, is £12 12s. 0d. Application should be made to the Secretary (Summer School), Battersea College of Technology, Battersea Park Road, London, S.W.11.

A Birmingham Office

News from the Alloys Division of **Union Carbide Ltd.** is to the effect that a new Birmingham office has been opened at 92 Newhall Street, Birmingham, 3, at which Mr. Edward Pickard, Southern Area representative, is located.

A Demonstration Van

A new development in automatic control equipment to increase the efficiency and quality of steel production has been demonstrated in London this week. A demonstration van has been fitted out with a full-size equipment controlling a ¼-scale working model steel rolling mill by the Metal Industries Division of **The English Electric Company Ltd.** A team of the company's experts have toured with the van to show industrialists the application of the new equipment, in controlling sequences of processing and production operations automatically.

The type of programming and automatic control equipment demonstrated can also be used with other industrial drives where a definite pattern of controlling movements is followed through in sequence and repeated many times; a different pattern of sequence merely requires the storage of a different programme.

The heart of this programming equipment is a component called a translator unit. This is a motorized switching device, first suggested for this duty by the British Iron and Steel Research Association. English Electric have developed and modified this unit to make it suitable for the very rugged and continuous duty required by the metal-making and rolling industries. The benefits are stated to be a more consistent quality of rolled products, greater productivity, less maintenance on the rolling mill and more efficient use of operating personnel. It has already been installed on one mill in this country, and is now being installed in others.

Tin Markets

In their latest tin review, **Vivian Younger and Bond** state that the rate of buying of tin has been a little quieter in March and April after being brisk in January and February. Supplies are coming forward at an appreciably lower rate than consumers are absorbing them. Accordingly, there is good reason to think that the price will remain up and that the Buffer Stock Manager will be enabled to continue exchanging his resources of tin metal into money. "Certainly the tin industry has entered much calmer water in 1959 after last year's buffetings."

The next meeting of the International Tin Council is fixed for May 26 in Copenhagen, and it remains to be seen whether the Council decides for or against a further rise in the rate of permitted exports.

It is believed that the United States Government has planned to obtain by barter some ten thousand tons of tin for the stockpile, and it is known that negotiations have gone forward with Bolivia for 5,000 and with Thailand for 2,250 tons. Indonesia is also reported to be considering a similar deal. Any such arrangements will not directly strengthen the tin market, but they will bring a measure of relief to the producing countries who are fortunate enough to fix them up.

U.K. Metal Stocks

Stocks of refined tin in London Metal Exchange warehouses fell by 218 tons, and were distributed as follows at the end of last week:—London 5,113 tons; Liverpool 2,307 tons, and Hull 1,095 tons.

Stocks of refined copper rose by 425 tons and were as follows:—London 2,012 tons, Liverpool 4,204 tons, Birmingham 850 tons, Manchester 3,300 tons, and Hull 375 tons.

X-ray Analytical Methods

A conference will be held on X-ray diffraction and spectrography in conjunction with the Department of Chemistry, at the **Imperial College of Science and Technology,** London, from Monday, July 6, to Friday, July 10 inclusive.

The conference will discuss and

evaluate modern techniques and instrumentation for diffractometry and fluorescent analysis. An extensive range of modern equipment will be available for demonstrating the principles of these methods over a wide field of applications. Time will be made available for the consideration and study of samples submitted by members. Sample preparation and presentation, together with the use made of electronic analytical information, will be discussed in relation to the requirements of industry.

Full information concerning the conference, together with details of the registration fees, may be obtained from the Conference Secretary at Research and Control Instruments Ltd., Instrument House, 207 Kings Cross Road, W.C.1, to whom all enquiries and applications should be addressed.

Marking of Metals

A new marking system, just announced by **Speedry Products Ltd.**, is designed to eliminate problems involved in the permanent and convenient marking of metals and metal surfaces, and of all other material used in the engineering and allied industries.

The "Magic Marker," already used throughout American industry, is a highly versatile device which does the work of paints, chalks, crayons and other marker systems. The ink it uses dries instantly and is both smudge-proof and waterproof —making it ideal for marking tools and spare parts, for use in the assembly line and sheet metal department, and for marking information or destination on all metal surfaces.

Engineering Show Train

Plans for a train of up to 60 specially designed show coaches which will carry a comprehensive exhibition of United Kingdom engineering products from coast to coast across Canada during May and June of 1960 are being formulated by the **British Engineering Association.** The venture by the B.E.A., who sponsored the Engineering, Marine, Welding and Nuclear Energy Exhibition, has been described by Mr. A. W. Berry, director of the Association, as "a bold and constructive endeavour to add momentum to steadily improving trade relations between Canada and the United Kingdom."

Starting from Vancouver and mounting exhibitions at not less than six of Canada's main industrial centres on the way, the journey will take approximately two months and is expected to cost about £500,000. Calgary, Edmonton, Winnipeg, Toronto, Montreal, Ottawa and Halifax are among centres likely to be visited.

Mr. Berry said the exhibition would be an undertaking of national importance on both sides of the Atlantic. It had already received the encouragement of Lord Rootes, chairman of the Dollar Exports Council. It would also do much to offset the criticism frequently levelled that Canadians were expected to travel to the United Kingdom to discover for themselves what equipment was available to them.

"Space on the train will necessarily be limited," continued Mr. Berry. "It can be assumed that the majority of the exhibitors will be taken from among the 520 engineering firms whose products were on show at Olympia." Many of the larger engineering combines had already shown a keen interest in the plan. But the team of exhibitors the Association hoped to take to Canada next year to represent the industry would not be drawn solely from the great groups of companies. He hoped the 500 firms and 17 trade associations of the British Engineers' Association would be strongly represented.

Epoxide Resins

Publication of advance information sheet E.32 has been announced by **Bakelite Limited.** This sheet gives full details of three new low-cost epoxide resin hardeners now being marketed by the company. With the introduction of the new hardeners DQ.19124, DQ.19125 and DQ.19129, the company has been able to formulate epoxide resin/hardener mixes at appreciably lower costs.

The information sheet, in addition to giving typical characteristics of these hardeners, also provides a number of suggested uses.

Safety Goggles

From the Birmingham firm of **E. Elliott Ltd.**, comes news of a new range of three models of safety goggles. They are designed to take replaceable "Celastoid" windows, which are tough, crystal clear, shatterproof and splinterproof.

The "Supaflex" model has been designed for comfort and all-round-the-eyes safety, and has an extra soft, pliable, transparent P.V.C. frame. The visor is designed so that it can, if necessary, be worn over spectacles, and is ventilated to prevent misting.

The "Birshield" is intended for operations where total enclosure is not required, and the "Birflex" has been redesigned with pliable polythene frame, and has replaceable, washable windows which are non-inflammable. All these models can also be supplied with windows in three shades of colour—green 1659, green shade 6, and antiflash S.465.

Nitrogen Generators

Details of the newly developed range of Birlec nitrogen generators are contained in a brochure just distributed by the Dryer and Gas Plant Division of **Birlec Limited.** Particular attention is drawn to the super purity grade, which is used in the electronic industry, and to the nitrogen mixtures employed in the metallurgical industries containing proportions of hydrogen or carbon monoxide with hydrogen.

These nitrogen generators, which are designed to provide the right grade to suit a wide variety of applications, separate nitrogen from air by the combustion of fuel, thus converting its oxygen content into carbon dioxide and water. These two waste constituents are then removed by absorption and condensation respectively.

Specially designed purification trains are available for eliminating unwanted gases down to low levels. Typical running cost analyses are quoted for the production of normal commercial grade nitrogen in Birlec generators, and for the purification cost in manufacturing special grade nitrogen.

Copper Roofing

First shipments of Ruberoid copper roofing, a new British product which has captured the interest of architects and builders at home and abroad, have been made to South Africa, Southern Rhodesia, East Africa and Nigeria. This information is contained in the latest issue of the export news sheet of the **Ruberoid Company Ltd.**

The product, which combines all the weatherproofing qualities of bitumen roofing with the best features of the traditional copper roof, has been chosen for such products as the new Customs House at Mombasa, the domed roof of the new Central Bank of Nigeria building in Lagos, and the new Union-Castle premises in Cape Town, say the manufacturers.

Sales Manager for Rocol

Continued expanding sales of the industrial and automobile molybdenized lubricants of **Rocol Ltd.** have necessitated some reorganization. Mr. John G. Gershon, who for several years has combined the offices of sales director and southern area sales manager, has now relinquished the latter and will, in future, be concerned with the overall U.K. sales policy.

In his place, Mr. E. T. Wilkinson has been appointed southern area sales manager for the whole of the South of England, including Birmingham and South Wales. He has been many years with the company.

German Light Metals Industry

An increase in turnover of 7·68 per cent in 1958 compared with 1957 was recorded by the West German light metals industry. Production in 1958 increased by 6·16 per cent compared with 1957, the German Light Metal Association has stated. Total 1958 turnover was 473,300,000 marks, with the value of exports rising by 4·4 per cent to 105,600,000 marks compared with 1957. Half the total value of exports were metal foil and strips, with sales to countries outside the European Common Market increasing. Imports of light metals and light metal products in 1958 were valued at 9·3 million marks, compared with 4·5 million marks in 1957.

Aluminium in Japan

The Japan Light Metals Association reports that output of primary aluminium in March increased over February, mostly due to an improvement in the supply of electric power. Deliveries in March sharply increased and hit a post-war high. Stocks at the end of March were considerably depleted compared with those at the end of February. Output, deliveries and end-month stocks in March were as follows (in metric tons): output, 7,494; deliveries, 8,382; end-month stocks, 2,359. Export shipments of primary aluminium in March totalled 102 metric tons, compared with nil in February. Export destinations in March were North Viet-Nam 100 tons and Bangkok 2 tons.

Buffer Stock Sales

Speaking in Singapore on Tuesday, Sir Ewen Ferguson, chairman of the Straits Trading Company, said at the company's annual meeting that, judging by the steadiness of the tin price around the £781 a ton mark, "it is safe to say that there have been steady sales from the Buffer Stock in the last two months." He said it might not be wide of the mark to suggest a figure of 20,000 tons as the present holding, or to suggest that a continuance of export control at current rates would see the stock liquidated in the first half of next year.

At this juncture, he said, it might be of interest to record that exports of tin

metal from the United Kingdom during January and February amounted to the very considerable total of 4,147 tons, against 7,618 tons for the whole of 1958. "It is assumed that much of this will have been Straits tin shipped to the United Kingdom in 1957 and sold to the Buffer Stock," he declared.

Sir Ewen pointed out that the International Tin Agreement was due to expire on July 1, 1961, and by the clauses applicable to the liquidation of the Buffer Stock, its last two years had a special significance. Questions which would exercise the minds of producers and consumers for some time to come were: first, would the Council decide on total liquidation during the two years and, secondly, would it be able to negotiate an extension of the present agreement, or would the framework of the agreement be subject to temporary alterations? "In particular, many producers would like to see some of their contributions to the Buffer Stock paid back in cash," Sir Ewen added.

Indonesian Tinplate Imports

Eight Indonesian semi-Government companies recently charged with handling the import of essential commodities, including tin plate, have set up a central committee to co-ordinate their work. The committee will receive and decide on all tenders from foreign companies to supply the goods, which would then be distributed among the companies.

Norwegian Survey

Teams of Government geologists will this summer survey deposits of several important metal ores in northern Norway. One group will study the extent and quality of nickel deposits in the Rana district, and the immediate aim is to determine whether the deposits are worth exploiting. The Minister of Industry told Parliament recently that the Government would seriously consider starting up nickel mines in the district, if the results of the survey were positive. The Government is anxious to create new jobs in northern Norway, where unemployment is high. Until the beginning of World War II, Norway was the biggest nickel producer in Europe, but in 1946 the last two mines were closed down, owing to the exhaustion of commercial-grade ore.

Deposits of manganese ore in the Ofoten-Maas river area will also be surveyed this summer. Initially, the survey will aim at determining the extent of the deposits; later on, bores will be made to permit a study of the quality of the ore. At present, no manganese ore is mined in Norway, and considerable amounts are imported annually for the country's ferro-alloy industry. Other surveys scheduled for this summer are of copper deposits in the Porsa district of Finnmark, and lead deposits in the Porsanger area, also in Finnmark.

Anaconda Company

Mr. Clyde E. Weed, chairman of the board of the Anaconda Company, reported this week that net income for the first quarter of 1959 increased substantially over the first quarter of 1958. He stated that estimated consolidated net income amounted to 16,250,000 dollars, or 1·52 dollars per share on the 10,714,267 shares of capital stock outstanding. This compares with earnings of 6,130,898 dollars for the first quarter of 1958, or 59 cents per share on the 10,409,191 shares of capital stock outstanding at that time, and reflects continued improvement over earnings for the last quarter of 1958 which totalled 14,574,032 dollars, or 1·36 dollars per share.

Mr. Weed said the material improvement in net income although due in part to substantial increases in deliveries of fabricated products, was principally the result of increased copper prices. Copper deliveries of the company were only slightly higher in the first quarter of 1959 than in the first quarter of 1958 and exceeded production during the first quarter of this year by less than 1,000 tons. In the quarterly report to stockholders, Mr. Weed commented further "in the absence of extended work stoppages when major labour agreements expire this summer, it appears the balance of copper supply and demand will be maintained on a reasonable basis throughout the year."

O.E.E.C. Zinc

Statistics from Paris state that zinc production in O.E.E.C. countries totalled 75,297 metric tons in March, 1959, compared with 64,071 metric tons in February 1959. It was about 5 per cent above March 1958. This total production included 29,641 metric tons of high grade and special high grade zinc, and 45,656 metric tons for other grades.

Total production of zinc ores and concentrates amounted to 32,237 metric tons of recoverable metal content in March 1959 (provisional) compared with 32,505 metric tons in February 1959. Details of February production were (metric tons): Austria 513, France 4,280 (including Metropolitan France), France 1,108, Algeria 3,172 (estimated), Germany 6,554, Italy 9,809, Norway 680, United Kingdom nil, Belgian Congo 6,712, Morocco 3,761 (estimated) and Tunisia 196.

Lead and Zinc Conference

A United Nations study group representing 28 countries began a series of private meetings on Monday which are expected to produce a number of recommendations to Governments interested in the lead and zinc market. The group is headed by Dr. F. Berckemeyer, Peruvian Ambassador to Washington. Dr. Berckemeyer, who is also vice-chairman of the Conference on Lead and Zinc, told Comtelburo that he was much encouraged by the progress which had been made in deliberations. He said that the Conference had been the most successful of its kind so far under United Nations auspices, and had lived up to the delegates' expectations.

U.S. Magnesium

U.S. shipments of magnesium wrought products rose 32 per cent in the first quarter, from the level a year earlier, the Magnesium Association has reported. Shipments totalled 2,589 tons, against 1,975 tons a year earlier. Primary magnesium ingot production in the quarter amounted to 5,527 tons, against 12,033 tons in the first quarter of 1958.

Australian Aluminium

It is reported from Sydney that the Australian Aluminium Company Limited has ordered equipment costing A£3,250,000 for major expansion of its rolling mill. The chairman, Mr. G. T. Hartigan, said the new plant was scheduled for completion in the second half of 1960.

Bronze and Brass Founders

ON Wednesday of last week, a general meeting of the **Association of Bronze and Brass Founders** was held at the Waldorf Hotel, London, the chairman being the President of the association, **Mr. P. B. Higgins**. After the minutes of the previous meeting had been confirmed, and other business mentioned, the President presented his report on the activities of the association for the past year.

In the course of his report, the President referred to the present membership of the association, the various successful area meetings which have been held in London, the Midlands, Lancashire, Cheshire, Yorkshire and Scotland. Dealing with apprentices' recruitment and training, the President stated that the Council had decided to form a sub-committee to report on the whole situation.

Other matters dealt with in the report included the safety, health and welfare conditions in non-ferrous foundries; the forthcoming Foundry Exhibition; the Technical Committee; the European committee of foundry associations; the export of scrap; the Intergovernmental conference on non-ferrous metals, and the foundry liaison committee. With regard to the latter, the President was pleased to be able to state that this liaison is working, and a great deal of credit is due to the efforts of the leaders of the Council of Ironfoundry Associations, the British Steel Founders' Association, and the Light Metal Founders' Association.

Following the President's report, the chairman of the Technical Committee presented his committee's report, which dealt with the B.S.1400 revision, the international standards organization, code of procedure for inspection, decimalization, and education.

At the conclusion of this meeting, the sixteenth annual meeting of the association was held, and after the minutes of the previous annual meeting and the accounts for the year had been approved and adopted, the election of officers for the ensuing year was carried out. It was proposed by the retiring President, **Mr. P. B. Higgins,** and seconded by **Mr. W. T. Hobkirk,** that **Mr. A. J. N. Brown** (Steven

Mr. A. J. N. Brown

and Struthers Ltd.) should be elected as President. This proposal was unanimously approved. The retiring President was then presented with the Past-President's badge.

Other officers elected were as follows:— **Mr. W. R. Buxton** (Eyre Smelting Co. Ltd.) as vice-president; **Mr. E. Ayres, Mr. W. R. Blakeborough, Mr. G. T. Hyslop** and **Mr. A. P. Wright,** the four retiring members of the Council, were re-elected, and the other two vacancies on the Council were filled by the election of **Mr. James J. Mundell** and **Mr. E. Walker.**

Metal Market News

AT a time when there is a good deal of talk about the necessity for a scheme which will bring stability to the copper price, it is worth noting that the quotation last week on the Metal Exchange was very steady, closing at a level which showed little change compared with the previous Friday. Early in the week the price advanced to £237 three months, but fell away when news came through, after the afternoon Kerb market on Thursday, that the custom smelters had reduced to 32 cents. May 1 was observed as a holiday in most Continental countries and in consequence trading was very quiet in London, the midday market in zinc reporting a nil turnover. Sentiment in the States is favourable and Wall Street sessions have registered gains, while in London stock exchange quotations have been in the ascendant. Nevertheless, there are reports that consumers are not showing a lot of interest in buying, the inference being that they are well covered by existing contracts and are possibly pursuing a policy of stock reduction into the bargain. The turnover on the standard copper market was 12,450 tons without Kerb dealing, and at the close last Friday afternoon cash stood at £233 15s. 0d. and three months at £234 15s. 0d. On balance, cash lost 15s., while three months was marked down by 10s. At one stage the contango widened to 25s., and it begins to look as though a premium for the forward position has come to stay. This, of course, depends on the maintenance of stocks at a right level and at the moment there are good grounds for thinking that reserves in L.M.E. warehouses will continue to increase. Some further widening of the gap between cash and three months would be justified, for, apart from warehouse rent and insurance, the cost of financing a warrant of copper is about £1 per ton per month.

Business in the other metals was rather featureless, and interest was lacking. However, the turnover in zinc was above 8,000 tons although, as mentioned above, trading on Friday was very slow. At the close, the quotation for the current month was £74 10s. 0d. and for August £74, these values being, respectively, 5s. and 2s. 6d. better than the previous Friday. Consumer demand for zinc is reported as disappointing, and there is fairly keen competition for any business that is going. Very much the same remarks apply to lead except that the loss for the early position was 15s. and for August 22s. 6d. The turnover was about average. The tin market lacks any special feature, but it would appear that the Pool is continuing to dispose of some of its holding by way of sales on the market, these taking the form of offers of cash metal. Very little change was seen in the quotations, for cash was up only £1 at £784 while three months appreciated by £1 10s. 0d. to £784 10s. 0d. Stocks at the beginning of last week fell by 472 tons to 8,733 tons, and this downward trend is likely to continue.

Stocks of copper in L.M.E. warehouses, on the other hand, are still rising, the latest figure available as we write being an addition of 175 tons to 10,316 tons. While this is a very great improvement on the reserves held earlier this year, it is still not really enough to serve as an adequate backing for the volume of transactions in the copper ring, and it is much to be hoped that the rising trend will continue. It may well do so, for production appears to be following an upward curve, and if the anticipated strike in the United States does not materialize then the second half of the year is certainly going to see a lot of copper available for use. Recently there has again been some talk about the advisability of altering the standard copper contract, either so as to provide for the delivery on the market of a lower grade than 99·7 per cent metal, or as to effecting a change in the discounts at present listed below the contract price.

New York

Custom smelters cut their selling price for copper by half a cent a lb. over the week-end to 32 cents. Demand was spotty. Some quarters reported satisfactory business at the new price, while others said trading continued slow. Meanwhile, at 31·50 cents a lb., the large producers are still being offered more business than they are either able or willing to accept. According to trade reports, large primary producers have not opened their books for June as yet, and are also completely sold out for May. Scrap was quiet and unchanged. On the Commodity Exchange, copper futures encountered more selling and prices were lower by as much as 25 points. Later, trading in copper was quiet.

The consuming demand for lead and zinc was described as moderate. Lead sales for the week were 9,217 tons. Tin continued very quiet and the price structure was steady.

According to well-informed trade sources, the Commodity Credit Corporation has temporarily withdrawn from the market as a buyer of lead through barter. The lead barter goal has been reached, according to these sources, and the agency is waiting for new authorization to resume its barter deals. While it is reported that the C.C.C. has temporarily stopped buying lead under the barter plan, it is understood to be open for offers of foreign zinc since the zinc barter goal is still unfilled.

Although there has been no official announcement, there is increasing optimism in industry sources here that the United Nations Conference on lead and zinc will produce a plan for stabilizing prices by cutting production and possibly controlling exports. Sources in close touch with the talks believe that there are good chances of an international agreement this year. From well-informed quarters it is learned that the Governments participating in the conference will recommend producing companies in their respective countries to reduce their exports of lead and zinc.

Birmingham

Business is expanding slowly in the Midland metal industries. A good trade continues in components for the car trade, although competition has increased with the entry of more firms into this industry. The building trade is more active than it was in the first quarter, and there has been a bigger demand for builders' brassfoundry and ironfoundry. More work is being done in the copper tube mills both in home and export markets. Copper wire works are busy on electrical orders. New business in the machine tool trade is not coming in fast enough to replace contracts being completed.

In the iron and steel trade, the slight expansion in buying has brought an increase in the number of shifts being worked in some of the steel rolling mills. There is, however, a good deal of spare capacity in the industry generally. A bigger call for small steel bars is helping the re-rolling mills, but there is still a dearth of new business in heavy joists and sections. The heavy engineering industries provide steady work for some of the iron foundries. Jobbing founders have fared badly during the trade recession, and much unemployment has been recorded in the numerous small foundries in the Black Country area. The motor trade absorbs a substantial tonnage of steel sheets each week.

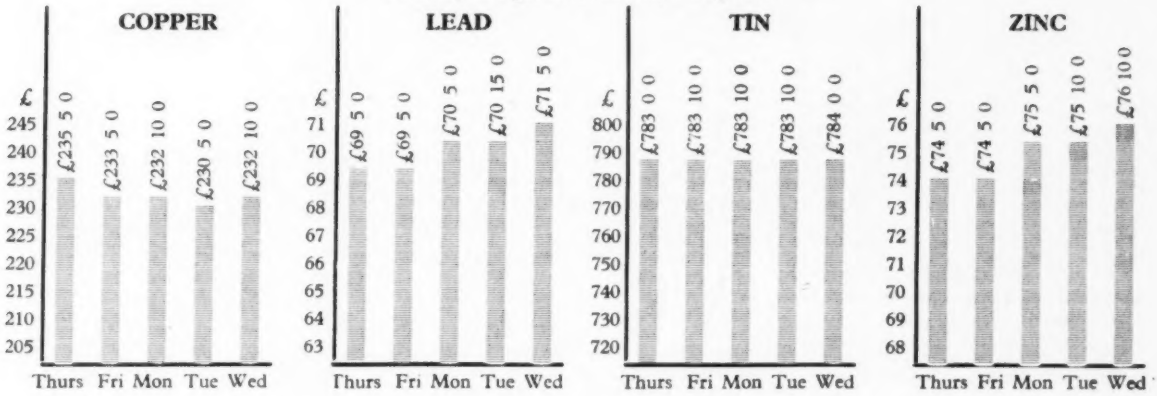
Singapore

According to the Straits Trading Company, tin shipments from Singapore for the month ending April 30 totalled 25¼ tons. They comprised: to Europe 1 ton; Pacific 10; India 7; Africa ¼; Australasia 2; and Middle East 5. Tin shipments from Penang for the same month totalled 2,535¼ tons and comprised: to the United States 1,167½ tons; Europe 170; Canada 75; Japan 631; Pacific 23¾; India 260; South America 119¾; Australasia 76½; and Middle East 11¼ tons.

Non-Ferrous Metal Prices

London Metal Exchange

Thursday 30 April to Wednesday 6 May 1959



Primary Metals

All prices quoted are those available at 2 p.m. 6/5/59

		£	s.	d.
Aluminium Ingots	ton	180	0	0
Antimony 99·6%	„	197	0	0
Antimony Metal 99%	„	190	0	0
Antimony Oxide	„	180	0	0
Antimony Sulphide Lump	„	190	0	0
Antimony Sulphide Black Powder	„	205	0	0
Arsenic	„	400	0	0
Bismuth 99·95%	lb.		16	0
Cadmium 99·9%	„		9	0
Calcium	„	2	0	0
Cerium 99%	„	16	0	0
Chromium	„		6	11
Cobalt	„		14	0
Columbite	per unit		—	
Copper H.C. Electro	ton	232	10	0
Fire Refined 99·70%	„	231	0	0
Fire Refined 99·50%	„	230	0	0

		£	s.	d.
Copper Sulphate	ton	76	0	0
Germanium	grm.		—	
Gold	oz.	12	9	3¾
Indium	„		10	0
Iridium	„	24	0	0
Lanthanum	grm.		15	0
Lead English	ton	71	5	0
Magnesium Ingots	lb.		2	3
Notched Bar	„		2	9½
Powder Grade 4	„		6	1
Alloy Ingot, A8 or AZ91	„		2	4
Manganese Metal	ton	245	0	0
Mercury	flask	78	0	0
Molybdenum	lb.	1	10	0
Nickel	ton	600	0	0
F. Shot	lb.		5	5
F. Ingot	„		5	6
Osmium	oz.		nom.	
Osmiridium	„		nom.	

		£	s.	d.
Palladium	oz.	7	5	0
Platinum	„	28	10	0
Rhodium	„	41	0	0
Ruthenium	„	18	0	0
Selenium	lb.		nom.	
Silicon 98%	ton		nom.	
Silver Spot Bars	oz.		6	7½
Tellurium	lb.		15	0
Tin	ton	784	0	0
***Zinc**				
Electrolytic	ton		—	
Min 99·99%	„		—	
Virgin Min 98%	„	75	17	6
Dust 95/97%	„	109	0	0
Dust 98/99%	„	115	0	0
Granulated 99+%	„	100	17	6
Granulated 99·99+%	„	114	7	6

**Duty and Carriage to customers' works for buyers' account.*

Foreign Quotations

Latest available quotations for non-ferrous metals with approximate sterling equivalents based on current exchange rates

	Belgium fr/kg ≏ £/ton		Canada c/lb ≏ £/ton		France fr/kg ≏ £ ton		Italy lire/kg ≏ £/ton		Switzerland fr/kg ≏ £/ton		United States c/lb ≏ £ ton	
Aluminium			22.50	185 17 6	224	163 0	375	221 5	2.50	212 10	26.80	214 10
Antimony 99.0					220	165 0	445	262 10			29.00	232 0
Cadmium					1,350	1,012 10					130.00	1,040 0
Copper												
Crude												
Wire bars 99.9							475	280 5 0				
Electrolytic	32.50	239 5 0	30.50	252 0	327	245 5			2.90	246 12 6	31.50	252 0
Lead			10 25	84 12 6	102	76 10	167	98 17 6	.85	74 0	11.50	92 0
Magnesium												
Nickel			70.00	578 5	900	675 0	1,200	708 0	7.50	637 10	74.00	592 0
Tin	111.25	817 2 6			1,124	843 0	1,500	885 0	9.60	816 0	102.62	820 17 6
Zinc												
Prime western			10.75	88 15 0							11.00	88 0
High grade 99.95			11.35	93 15 0								
High grade 99.99			11.75	97 0 0								
Thermic					111.00	83 5						
Electrolytic					119.00	89 5	169	99 17 6	.95	80 17 6	12.25	98 0

Non-Ferrous Metal Prices (continued)

Ingot Metals

All prices quoted are those available at 2 p.m. 6/5/59

		£	s.	d.
Aluminium Alloy (Virgin)				
B.S. 1490 L.M.5	ton	210	0	0
B.S. 1490 L.M.6	,,	202	0	0
B.S. 1490 L.M.7	,,	216	0	0
B.S. 1490 L.M.8	,,	203	0	0
B.S. 1490 L.M.9	,,	203	0	0
B.S. 1490 L.M.10	,,	221	0	0
B.S. 1490 L.M.11	,,	215	0	0
B.S. 1490 L.M.12	,,	223	0	0
B.S. 1490 L.M.13	,,	216	0	0
B.S. 1490 L.M.14	,,	224	0	0
B.S. 1490 L.M.15	,,	210	0	0
B.S. 1490 L.M.16	,,	206	0	0
B.S. 1490 L.M.18	,,	203	0	0
B.S. 1490 L.M.22	,,	210	0	0
†Aluminium Alloys (Secondary)				
B.S. 1490 L.M.1	ton		—	
B.S. 1490 L.M.2	,,		—	
B.S. 1490 L.M.4	,,		—	
B.S. 1490 L.M.6	,,		—	
***Aluminium Bronze**				
BSS 1400 AB.1	ton	230	0	0
BSS 1400 AB.2	,,	236	0	0

		£	s.	d.
***Brass**				
BSS 1400-B3 65/35	ton	155	0	0
BSS 249	,,		—	
BSS 1400-B6 85/15	,,	195	0	0
***Gunmetal**				
R.C.H. 3/4% tin	,,		—	
(85/5/5/5)	,,	192	0	0
(86/7/5/2)	,,	203	0	0
(88/10/2/1)	,,	240	0	0
(88/10/2/½)	,,	260	0	0
***Manganese Bronze**				
BSS 1400 HTB1	,,	189	0	0
BSS 1400 HTB2	,,		—	
BSS 1400 HTB3	,,	214	0	0
Nickel Silver				
Casting Quality 12%	,,	215	0	0
,, ,, 16%	,,	225	0	0
,, ,, 18%	,,	240	0	0
***Phosphor Bronze**				
B.S. 1400 P.B.1. (A.I.D. released)	,,	291	0	0
B.S. 1400 L.P.B.1	,,	210	0	0

**Average prices for the last week-end.*

		£	s.	d.
Phosphor Copper				
10%	ton	253	0	0
15%	,,	255	10	0
Phosphor Tin				
5%	,,		—	
Silicon Bronze				
BSS 1400-SB1	,,	245	0	0
Solder, soft, BSS 219				
Grade C Tinmans	,,	365	0	0
Grade D Plumbers	,,	293	10	0
Grade M	,,	400	10	0
Solder, Brazing, BSS 1845				
Type 8 (Granulated)	lb.		—	
Type 9 ,,	,,		—	
Zinc Alloys				
Mazak III	ton	107	12	6
Mazak V	,,	111	12	6
Kayem	,,	117	12	6
Kayem II	,,	123	12	6
Sodium-Zinc	lb.		2	6

Semi-Fabricated Products

Prices vary according to dimensions and quantities. The following are the basis prices for certain specific products

		£	s.	d.
Aluminium				
Sheet 10 S.W.G.	lb.		2	8½
Sheet 18 S.W.G.	,,		2	10½
Sheet 24 S.W.G.	,,		3	1½
Strip 10 S.W.G.	,,		2	8½
Strip 18 S.W.G.	,,		2	9½
Strip 24 S.W.G.	,,		2	11
Circles 22 S.W.G.	,,		3	2½
Circles 18 S.W.G.	,,		3	1½
Circles 12 S.W.G.	,,		3	0½
Plate as rolled	,,		2	8
Sections	,,		3	2
Wire 10 S.W.G.	,,		2	11½
Tubes 1 in. o.d. 16 S.W.G.	,,		4	1
Aluminium Alloys				
BS1470. HS10W.				
Sheet 10 S.W.G.	,,		3	1
Sheet 18 S.W.G.	,,		3	3½
Sheet 24 S.W.G.	,,		3	11
Strip 10 S.W.G.	,,		3	1
Strip 18 S.W.G.	,,		3	2½
Strip 24 S.W.G.	,,		3	10½
BS1477. HP30M.				
Plate as rolled	,,		2	11
BS1470. HC15WP.				
Sheet 10 S.W.G.	,,		3	9½
Sheet 18 S.W.G.	,,		4	2
Sheet 24 S.W.G.	,,		5	0½
Strip 10 S.W.G.	,,		3	10½
Strip 18 S.W.G.	,,		4	2
Strip 24 S.W.G.	,,		4	9½
BS1477. HPC15WP.				
Plate heat treated	,,		3	6½
BS1475. HG10W.				
Wire 10 S.W.G.	,,		3	10½
BS1471. HT10WP.				
Tubes 1 in. o.d. 16 S.W.G.	,,		5	0½
BS1476. HE10WP.				
Sections	,,		3	1½
Brass				
Tubes	,,		1	10½
Brazed Tubes	,,		—	
Drawn Strip Sections	,,		—	
Sheet	ton		—	
Strip	,,	252	5	0
Extruded Bar	lb.		1	11½
Extruded Bar (Pure Metal Basis)	,,		—	

		£	s.	d.
Brass				
Condenser Plate (Yellow Metal)	ton	187	0	0
Condenser Plate (Naval Brass)	,,	199	0	0
Wire	lb.		2	7½
Beryllium Copper				
Strip	,,	1	4	11
Rod	,,	1	1	6
Wire	,,	1	4	9
Copper				
Tubes	lb.		2	3½
Sheet	ton	262	0	0
Strip	,,	262	0	0
Plain Plates	,,		—	
Locomotive Rods	,,		—	
H.C. Wire	,,	284	5	0
Cupro Nickel				
Tubes 70/30	lb.		3	6½

		£	s.	d.
Lead				
Pipes (London)	ton	111	5	0
Sheet (London)	,,	109	0	0
Tellurium Lead	,,	£6 extra		
Nickel Silver				
Sheet and Strip 7%	lb.		3	8
Wire 10%	,,		4	2¾
Phosphor Bronze				
Wire	,,		4	0½
Titanium (1,000 lb. lots)				
Billet over 4″ dia.-18″ dia.	lb.	63/-		64/-
Rod 4″ dia.-·250″ dia.	,,	75/-		112/-
Wire under ·250″ dia.-·036″ dia.	,,	146/-		222/-
Sheet 8′ × 2′ × ·250″-·010″		88/-		157/-
Strip ·048″-·003″	,,	100/-		350/-
Tube	,,			300/-
Extrusions	,,			120/-
Zinc				
Sheet	ton	110	5	0
Strip	,,		nom.	

Domestic and Foreign

Merchants' average buying prices delivered, per ton, 5/5/59.

	£
Aluminium	
New Cuttings	146
Old Rolled	126
Segregated Turnings	98
Brass	
Cuttings	153
Rod Ends	143
Heavy Yellow	124
Light	119
Rolled	144
Collected Scrap	121
Turnings	136
Copper	
Wire	211
Firebox, cut up	210
Heavy	205
Light	200
Cuttings	211
Turnings	191
Braziery	161

	£
Gunmetal	
Gear Wheels	180
Admiralty	180
Commercial	163
Turnings	158
Lead	
Scrap	60
Nickel	
Cuttings	—
Anodes	550
Phosphor Bronze	
Scrap	163
Turnings	158
Zinc	
Remelted	63
Cuttings	53
Old Zinc	37

Financial News

Firth Cleveland

Group trading profit, etc., for 14 months ended December 31, 1958, £2,213,952 (£1,997,603), including £156,302 (nil) profits attributable to earlier periods. After tax £882,714 (£796,533), net profit £971,336 (£928,986). No dividend for period (same). Attributable to parent £893,933 (£881,189). To general reserve £500,000 (£595,508), group forward £1,376,296 (£1,050,938). Fixed assets £2,761,627 (£2,461,632), investment in Firth Cleveland Finance £500,000 (nil) and balance due to difference in accounting dates £64,950 (£12,908). Current assets £7,372,084 (£6,686,025) and liabilities £3,831,752 £3,325,039). Commitments £82,000 (£105,000).

Tube Investments Ltd.

At a meeting of the board, held in London last week, the following dividends were declared, less income tax at 7s. 9d. in the £:—On the 7 per cent Cumulative First Preference Stock and on the 4½ per cent Redeemable Cumulative Preference Stock, a dividend at the authorized rate for each class of stock for the half-year ending May 31, 1959. On the Ordinary Stock, an interim dividend of 7½ per cent actual on account of the year ending July 31, 1959. The dividends are payable to members on the registers on April 14, 1959.

International Nickel

At the annual meeting of the International Nickel Company of Canada Limited, held last week in Toronto, the chairman, Dr. John F. Thompson, commenting on the outlook, said that net earnings of the company for the first quarter of 1959 are expected to show an improvement over the corresponding quarter a year ago, when they totalled $12,200,000, equal to 83 cents per common share. Contributing factors, he said, to the expected improved earnings for the first quarter were a sharp surge in demand for nickel in the United States, higher prices for copper, and increased sales of platinum metals. In his concluding remarks, Dr. Thompson said it was anticipated that the world demand for nickel would continue through 1959 at a rate higher than in 1958. This, together with improved prices for copper and platinum metals, should result in a satisfactory year.

Italian Quicksilver

Societa Stabilimento Minerario del Siele (one of the two major quicksilver producers in Italy) in the year to December 31 last had a net profit of 160·4 million lire, compared with 541·3 million lire in 1957. The smaller profit is attributed to the manufacturing tax on quicksilver, which is said to be hampering exports. A dividend of 100 lire per share, against 300 lire the previous year, has been approved by shareholders.

Brunswick Mining

In its annual report, Brunswick Mining and Smelting Corporation Limited, Toronto, states that until supply and demand for lead and zinc reach better balance, and the cost of financing is more favourable, directors believe it would be unwise to proceed with plans for production. The company, whose mining property is in the Bathurst area of northern New Brunswick, postponed production plans a year ago, and the property has been on a "shutdown-watchman" basis since.

New Companies

The particulars of companies recently registered are quoted from the daily register compiled by Jordan and Sons Limited, Company Registration Agents, Chancery Lane, W.C.2.

Jackson Bridge Engineering Company Limited (624161), Britannia Buildings, Huddersfield. Registered March 25, 1959. To take over the business of The Spencer Wire Company Limited, and to carry on business of wire drawers and manufacturers, etc. Nominal capital, £13,100 in £1 shares. Directors to be appointed by subscribers.

Charles T. Dobson Limited (624380). Registered March 31, 1959. To take over business of Charles T. Dobson carried on at 297 Corporation Street, Birmingham, and to carry on business of metal and scrap merchants, etc. Nominal capital, £3,000 in £1 shares. Directors: Chas. T. Dobson and Mrs. Josephine A. N. Dobson.

Cannock Metal and Supply Co. Limited (624496), East Street, Bridgtown, Cannock. Registered March 31, 1959. To carry on business of merchants, dealers, workers, smelters of and manufacturers of metal, etc. Nominal capital, £5,000 in £1 shares. Directors to be appointed by subscribers.

Maryland Metal Works Ltd. (624743), 375-6 Station Road, Forest Gate, E.7. Registered April 2, 1959. Nominal capital, £5,000 in £1 shares. Directors: Geo. W. Port and Mrs. E. L. Port.

Scrap Metal Prices

The figures in brackets give the English equivalents in £1 per ton:—

West Germany (D-marks per 100 kilos):

Used copper wire	(£205.17.6)	235
Heavy copper	(£201.10.0)	230
Light copper	(£175.5.0)	200
Heavy brass	(£118.5.0)	135
Light brass	(£92.0.0)	105
Soft lead scrap	(£57.0.0)	65
Zinc scrap	(£36.15.0)	42
Used aluminium unsorted	(£83.5.0)	95

France (francs per kilo):

Electrolytic copper scrap	(£191.5.0)	255
Heavy copper	(£191.5.0)	255
No. 1 copper wire	(£180.0.0)	240
Light brass	(£112.12.6)	150
Zinc castings	(£48.15.0)	65
Lead	(£64.12.6)	86
Aluminium	(£120.0.0)	160

Italy (lire per kilo):

Aluminium soft sheet clippings (new)	(£197.12.6)	335
Aluminium copper alloy	(£126.17.6)	215
Lead, soft, first quality	(£75.12.6)	128
Lead, battery plates	(£41.17.6)	71
Copper, first grade	(£221.5.0)	375
Copper, second grade	(£209.10.0)	355
Bronze, first quality machinery	(£206.12.0)	350
Bronze, commercial gunmetal	(£183.0.0)	300
Brass, heavy	(£144.10.0)	245
Brass, light	(£129.17.6)	220
Brass, bar turnings	(£132.15.0)	225
New zinc sheet clippings	(£51.5.0)	97
Old zinc	(£42.10.0)	72

Trade Publications

Electrolytic Conductivity. — Electronic Switchgear (London) Ltd., Works Road, Letchworth, Herts.

A useful leaflet describing a recently-developed range of electrolytic conductivity recording and indicating instruments has just been issued by this company. The type RIC3 unit has been designed to perform but one function with utmost efficiency, to automatically and precisely measure, indicate and record conductivity of electrolytes. The unit is constructed for convenient rear-of-panel access to valves and other items that require but infrequent attention. Operational accuracy is independent of normal mains voltage and circuit parameter variations.

Rust Proofing.—Southern Metalife Ltd., Station Square, Harrogate, Yorks.

A recent addition to the Metalife range of rust proofing and corrosion resisting liquid metals for the protection of iron and steel is dealt with in a brochure recently issued. This addition, known as "Metalife 1000" is a coating which will withstand temperatures up to 1,000° F. and the makers state that two coats of this liquid metal, applied by brushing or spraying, will not only be resistant to heat, but will really give outstanding resistance to corrosion.

Ventilating Problems. — Templewood Hawksley, Ventilation Div., Coleridge Chambers, 177 Corporation Street, Birmingham, 4.

Two brochures issued by this company deal with (1) a power-operated roofing shutter which provides for rapid clearing of smoke and fumes, at the same time giving adequate lighting at working level, and, (2) cowl extractor ventilators designed for natural controlled ventilation where complete storm protection is required. Both products are suitable for flat, sloping, sheeted or glazed roof structures, and installation can proceed in nearly all cases without interruption to production.

Metal Finishing —The Pyrene Company Ltd., Metal Finishing Division, Great West Road, Brentford, Middx.

A handy guide to services available from this division is contained in a twelve-page brochure issued by the company. Many details relating to the "Bonderizing," "Parkerizing" and other pre-treatment processes now provided by this company are given, together with a number of illustrations showing many of the departments and services in operation. A range of materials is described and some typical pre-treatment plants illustrated, as well as some notes on ancillary equipment.

THE STOCK EXCHANGE

Industrials Continued Active And Strong. Sharp Rise In Davy & United

ISSUED CAPITAL •	AMOUNT OF SHARE	NAME OF COMPANY	MIDDLE PRICE 5 MAY	+RISE—FALL	DIV. FOR LAST FIN. YEAR	DIV. FOR PREV YEAR	DIV. YIELD	1959 HIGH	1959 LOW	1958 HIGH	1958 LOW
£	£				Per cent	Per cent					
4,435,792	1	Amalgamated Metal Corporation	26/6		9	10	6 15 9	27/-	23/3	24/9	17/6
400,000	2/-	Anti-Attrition Metal	1/6		4	8½	5 6 9	—	—	1/9	1/3
41,305,038	Stk. (£1)	Associated Electrical Industries	60/6	—6d.	15	15	4 19 3	61/9	54/-	58/9	46/6
1,609,032	1	Birfield	47/-xd		15	15	6 7 9	59/-	47/-	62/4½	46/3
3,196,667	1	Birmid Industries	75/6	+9d.	17½	17½	4 12 9	76/10½	72/-	77/6	55/3
5,630,344	Stk. (£1)	Birmingham Small Arms	43/3	+1/6	11	10	5 1 9	43/3	36/1½	39/-	23/9
203,150	Stk. (£1)	Ditto Cum. A. Pref. 5%	16/3		5	5	6 3 0	16/3	15/-	16/1½	14/7½
350,580	Stk. (£1)	Ditto Cum. B. Pref. 6%	17/9		6	6	6 15 3	18/1½	17/9	17/4½	16/6
500,000	1	Bolton (Thos.) & Sons	30/-		10	12½	6 13 3	30/-	27/6	28/9	24/-
300,000	1	Ditto Pref. 5%	15/6		5	5	6 9 0	15/6	15/-	16/-	15/-
160,000	*	Booth (James) & Co. Cum. Pref. 7%	20/-		7	7	7 0 0	—	—	20/4½	19/-
1,500,000	Stk. (£1)	British Aluminium Co. Pref. 6%	19/6		6	6	6 3 0	19/7½	18/9	20/-	18/4½
15,000,000	Stk. (£1)	British Insulated Callender's Cables	56/-		12½	12½	4 9 3	56/-	47/6	52/6	38/9
17,047,166	Stk. (£1)	British Oxygen Co. Ltd., Ord.	58/6	+1/3	10	10	3 8 6	58/6	49/3	52/-	28/3
600,000	Stk. (5/-)	Canning (W.) & Co.	31/3xd	+1½d.	25 + *2½C	25	4 0 0	31/9	24/9	25/3	19/3
60,484	1/-	Carr (Chas.)	1/10½		12½	25	6 13 3	2/3	1/3	2/3	1/4½
150,000	2/-	Case (Alfred) & Co. Ltd.	5/1½	+1½d.	25	25	9 15 0	5/3	4/7½	5/3	4/-
555,000	1	Clifford (Chas.) Ltd.	23/6		10	10	8 10 3	23/6	22/6	22/-	16/-
45,000	1	Ditto Cum. Pref. 6%	16/-		6	6	7 10 0	16/-	15/3	16/-	15/-
250,000	2/-	Coley Metals	4/-		20	25	10 0 0	4/-	2/10½	4/6	2/6
8,730,596	1	Cons. Zinc Corp.†	62/3	+2/3	18¾	22½	6 0 6	67/6	60/-	65/3	41/-
1,509,528	1	Davy & United	106/3	+8/6	20	15	3 15 3	106/3	86/-	87/-	45/9
5,830,000	5/-	Delta Metal	16/9xcap		31‡	30	4 12 6	33/7½	16/9	25/-	17/7½
4,600,000	Stk. (£1)	Enfield Rolling Mills Ltd.	50/3	+2/6	15	12½	5 19 6	50/3	36/7½	38/-	22/9
750,000	1	Evered & Co.	31/6		10 §	15 Z	6 7 0	31/6	30/-	30/-	26/
18,000,000	Stk. (£1)	General Electric Co.	32/9	+9d.	10P	12½		40/3	30/9	40/6	29/6
1,500,000	Stk. (10/-)	General Refractories Ltd	32/6	—6d.	20	20	6 3 0	40/-	32/6	39/3	27/3
401,240	1	Gibbons (Dudley) Ltd.	64/-		16½	15	4 13 6	66/6	64/-	67/6	61/-
750,000	5/-	Glacier Metal Co. Ltd.	7/3		11½	11½	7 18 6	7/3	6/7½	8/3	5/-
1,750,000	5/-	Glynwed Tubes	19/-		20	20	5 5 3	19/3	16/4½	18/1½	12/10½
5,421,049	10/-	Goodlass Wall & Lead Industries	35/3	+1/3	13‖	18Z	3 13 9	35/3	28/7½	30/9	17/3
342,195	1	Greenwood & Batley	83/-	+1/3	20	17½	4 16 6	83/9	75/-	57/9	45/-
396,000	5/-	Harrison (B'ham) Ord.	18/6	+6d.	*17½	*15	4 14 6	18/9	14/11½	15/9	11/6
150,000	1	Ditto Cum. Pref. 7%	19/6		7	7	7 3 6	—	—	19/9	18/4½
1,075,167	5/-	Heenan Group	8/3		10	10‡	6 1 3	8/6	7/6	9/7½	6/9
236,958,260	Stk. (£1)	Imperial Chemical Industries	34/6	—3d.	12Z	10	4 12 9	38/3	33/9	38/-	24/3
34,736,773	Stk. (£1)	Ditto Cum. Pref. 5%	17/-	—1½d.	5	5	5 17 9	17/1½	16/-	17/1½	16/-
14,584,025	**	International Nickel	164½	+1¾	$2.60	$3.75	2 16 6	171	153	169	132¾
860,000	5/-	Jenks (E. P.), Ltd.	10/-	+1½d.	14	27½ϕ	7 0 0	10/-	8/9	10/-	6/7½
300,000	1	Johnson, Matthey & Co. Cum. Pref. 5%	16/3		5	5	6 3 0	16/3	15/4½	16/9	15/-
3,987,435	1	Ditto Ord.	50/-	+1/6	10	10	4 0 0	52/6	44/3	47/-	36/6
600,000	10/-	Keith, Blackman	28/9		17½E	15	6 1 9	28/9	25/-	28/9	15/-
320,000	4/-	London Aluminium	5/7½	+3d.	10	10	7 2 3	6/4½	5/3	6/-	3/-
765,012	1	McKechnie Brothers Ord.	42/6xd	+6d.	15	15	7 1 3	45/-	42/6	45/-	32/-
1,530,024	1	Ditto A Ord.	39/6xd		15	15	7 12 0	43/6	39/6	45/-	30/-
1,108,268	5/-	Manganese Bronze & Brass	16/3xd	+4½d.	20	27½‡	6 3 0	16/3	13/9	14/1½	8/9
50,628	6/-	Ditto (7½% N.C. Pref.)	6/-xd	+1½d.	7½	7½	7 10 0	—	—	6/3	5/6
13,098,855	Stk. (£1)	Metal Box	77/9	+2/-	11	11	2 16 6	78/9	66/6	73/3	40/6
415,760	Stk. (2/-)	Metal Traders	9/9		50	50	10 5 3	9/9	8/4½	9/-	6/3
160,000	1	Mint (The) Birmingham	25/-		10	10	8 0 0	25/-	22/-	22/9	19/-
80,000	5	Ditto Pref. 6%	72/6		6	6	8 5 6	75/6	69/-	83/6	69/-
3,705,670	Stk. (£1)	Morgan Crucible A	46/6		10	10	4 6 0	46/6	43/6	45/-	34/-
1,000,000	Stk. (£1)	Ditto 5½% Cum. 1st Pref.	17/6		5½	5½	6 5 9	18/6	17/6	18/-	17/-
2,200,000	Stk. (£1)	Murex	46/9	—1/-	17½	20	7 9 9	50/-	42/-	58/9	46/-
468,000	5/-	Ratcliffs (Great Bridge)	9/9xcap	+1½d.	10R	10	3 17 0	11/6	9/9	11/1½	6/10½
234 960	10/-	Sanderson Bros. & Newbould	31/6		20	27½D	6 7 0	31/6	27/9	27/3	24/6
1,365,000	Stk. (5/-)	Serck	20/6	+3d.	15	17½	3 13 3	20/8½	18/-	18/7½	11/-
6,698,586	Stk. (£1)	Stone-Platt Industries	51/9	+6d.	15	12½	5 16 0	51/9	43/3	45/6	22/6
2,928,963	Stk. (£1½)	Ditto 5½% Cum. Pref.	17/6		5½	5½	6 5 9	17/6	15/10½	16/3	12/7½
18,255,218	Stk. (£1)	Tube Investments Ord.	85/-	+2/7½	17½	15	4 2 3	85/-	72/-	86/-	48/4½
41,000,000	Stk. (£1)	Vickers	33/9xd	—6d.	10	10	5 18 6	37/-	30/6	36/3	28/9
750,000	Stk. (£1)	Ditto Pref. 5%	14/6		5	5	6 18 0	15/0¾	14/6	15/9	14/3
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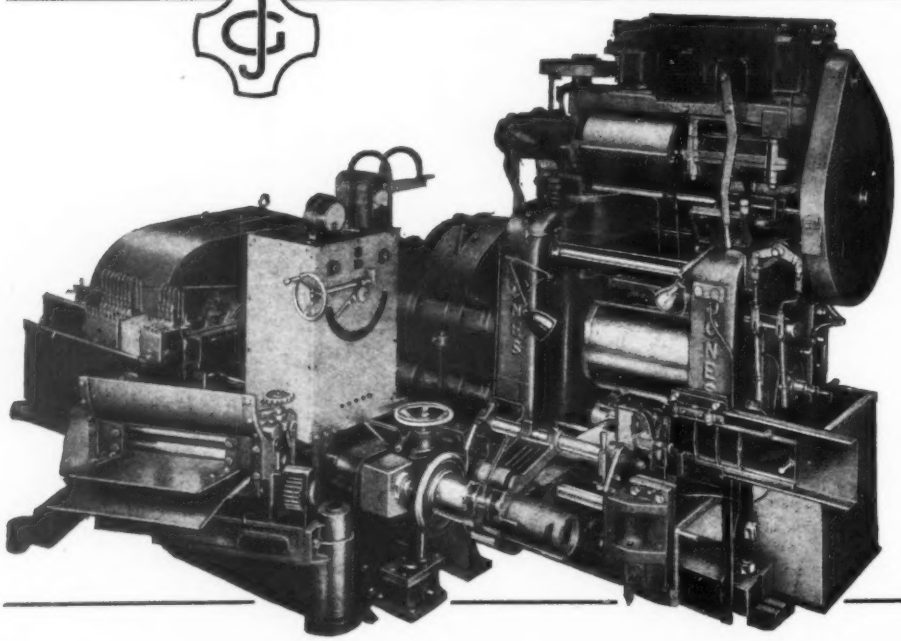

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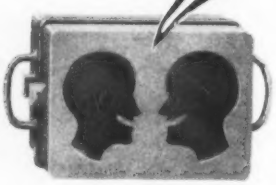

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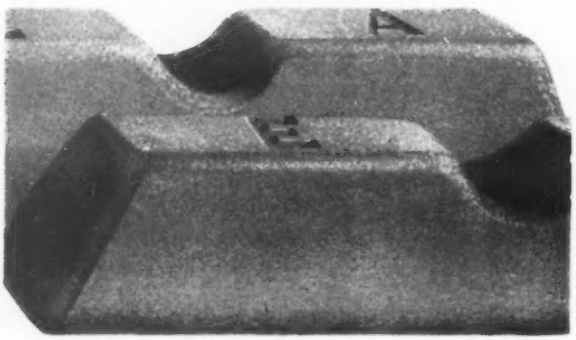

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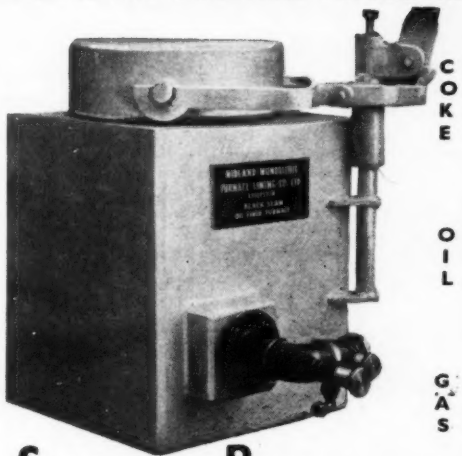

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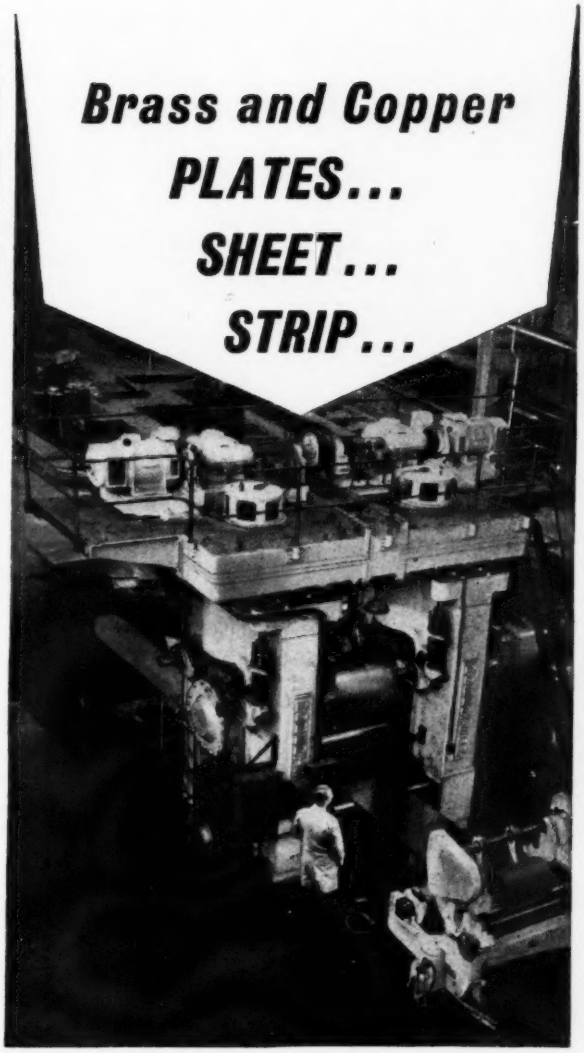

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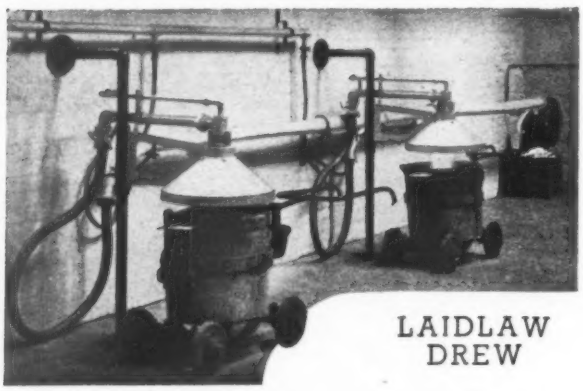

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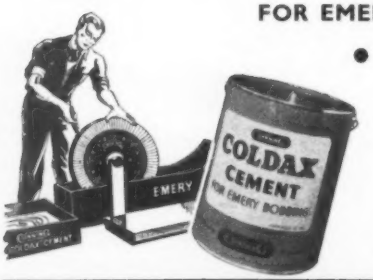

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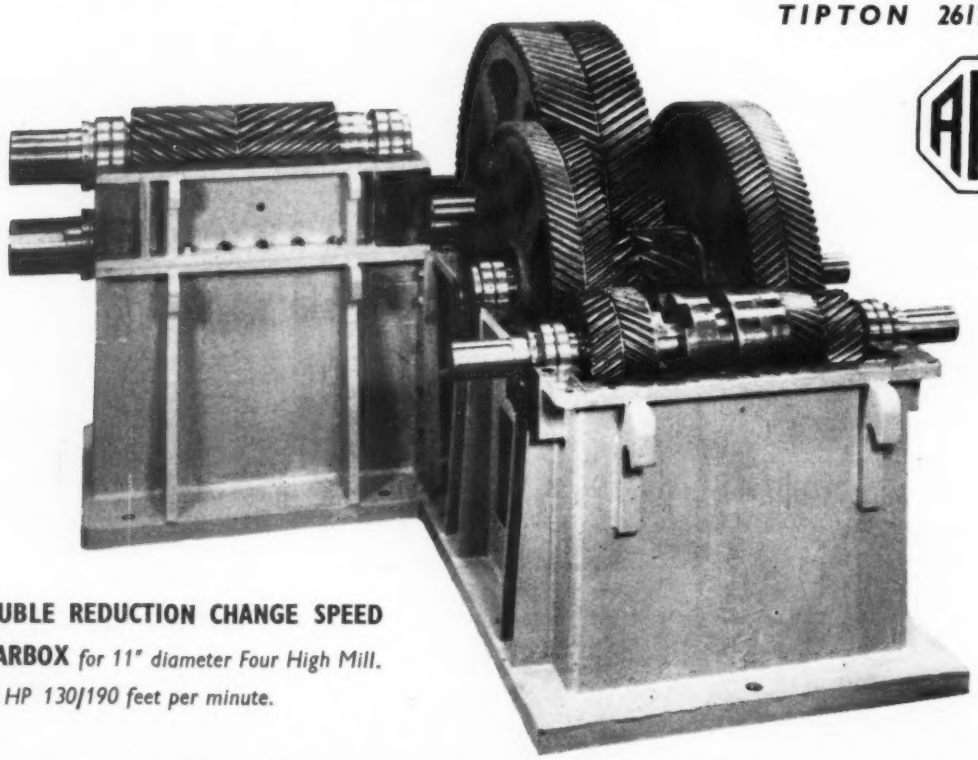

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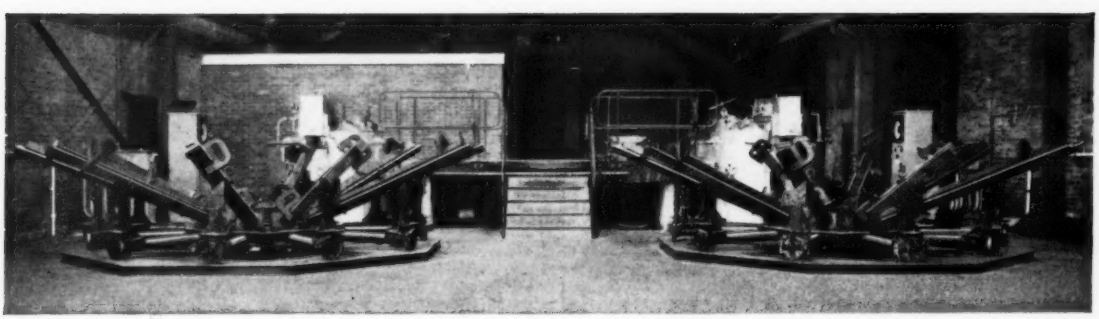

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